THE Journal OF THE

AMERICAN DENTAL ASSOCIATION

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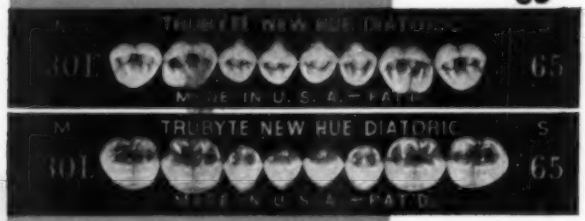
there's a best posterior tooth for every denture technique

33°



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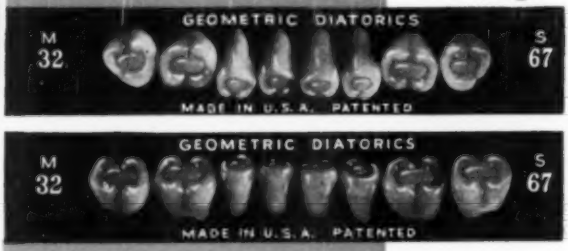

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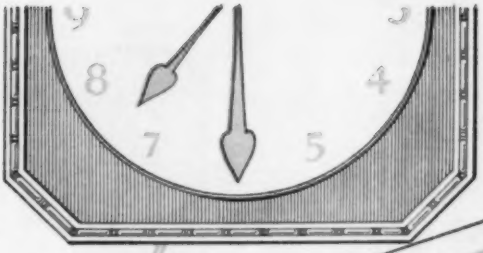

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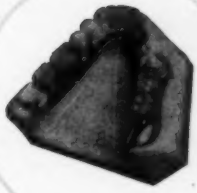

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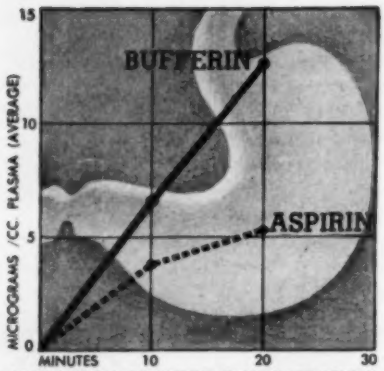

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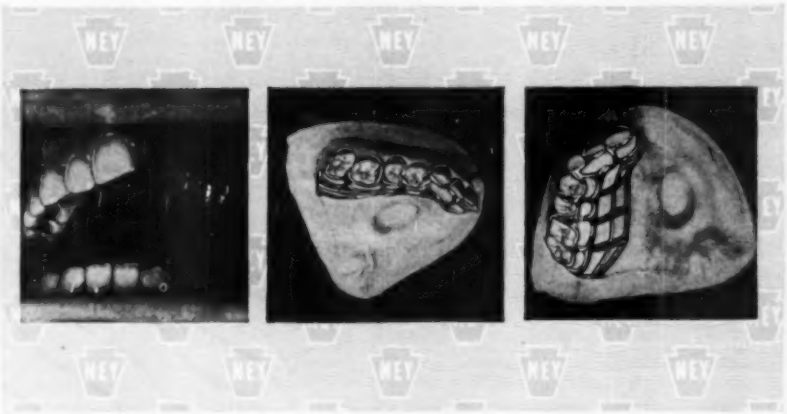
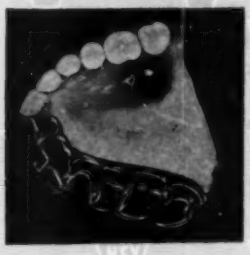


1 This child lost all teeth and maxilla on the left side from surgery required for removal of a cystic muscular tumor.

2 Analysis on the Ney Surveyor indicated that it would be possible to design an appliance which would have the desired stability and retention.

3 The sturdy framework was cast in NEY-ORO G-3. Well designed clasps took advantage of all favorable undercut conditions for bracing and retention.

4 The appliance was finished in acrylic, and this view of it from the tissue side shows the unusual clasp design worked out by the Ney Surveyor System.



5 Here is a palatal view of the denture, which goes to place by having the anterior clasps engage their undercuts first, followed by the bicuspid clasp and finally the molar clasps.

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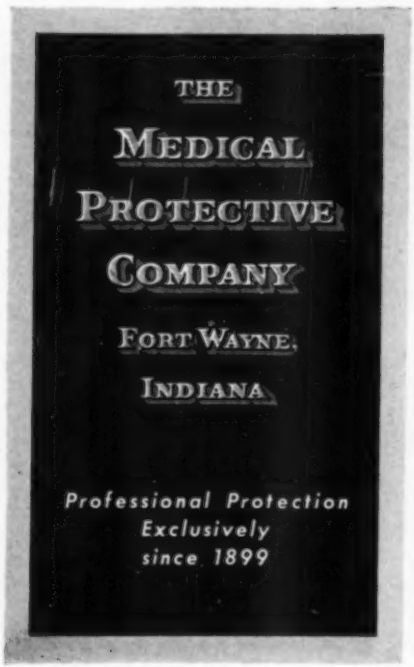

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*Holmes, A. D., Kuzmeski, J. W. and Canavan, F. T. *Stability of vitamins in stored ice cream.* J. Am. Diet. Assn. 22:670 (Aug.) 1946.

**Everson, G., Wheeler, E., Walker, H. and Caulfield, W. J. *Availability of riboflavin of ice cream, peas and almonds judged by urinary excretion of the vitamin by women subjects.* J. Nutrition 35:209 (Feb.) 1948.

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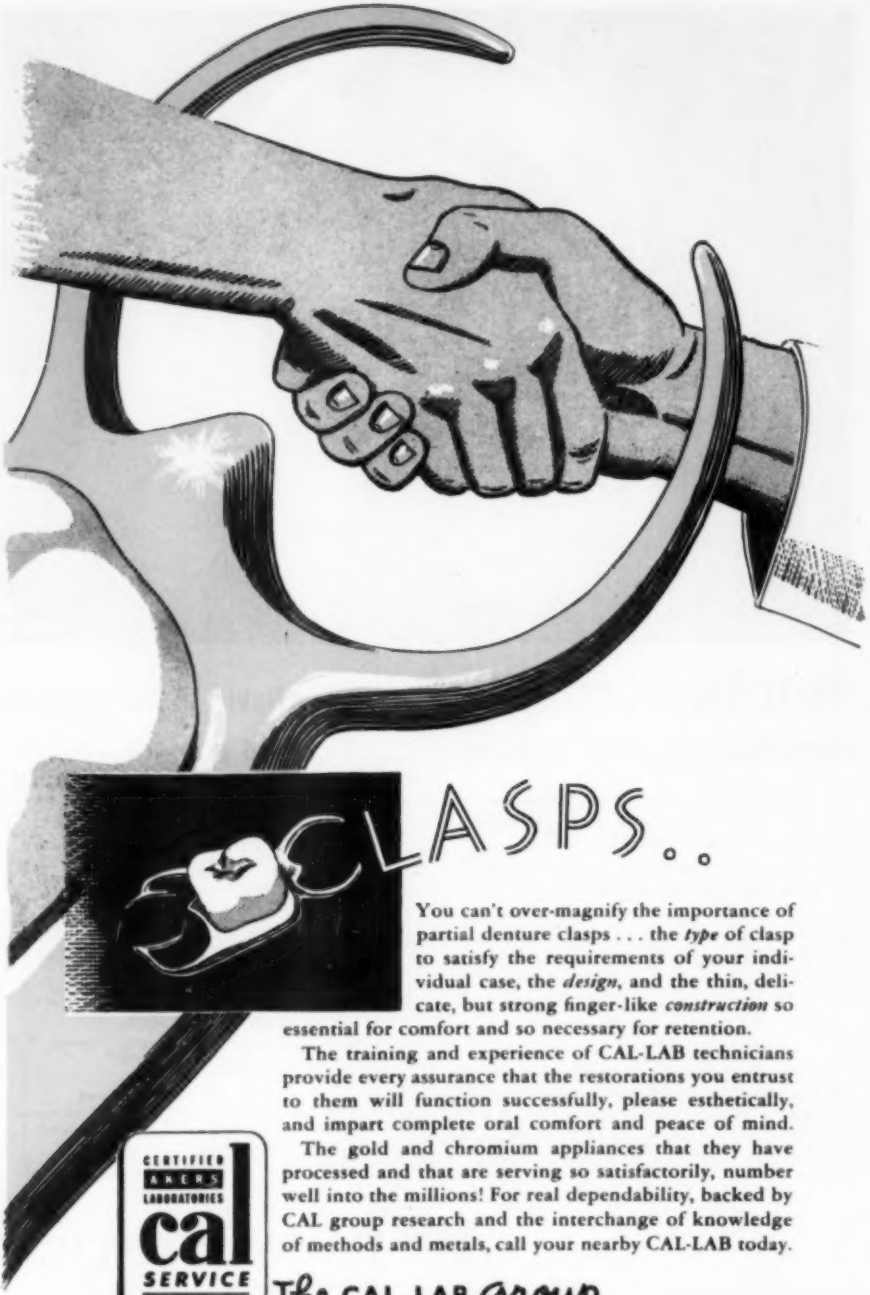

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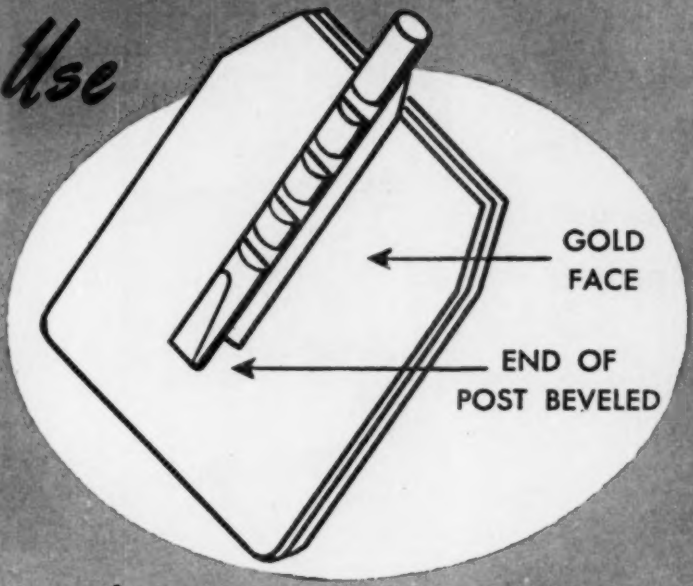

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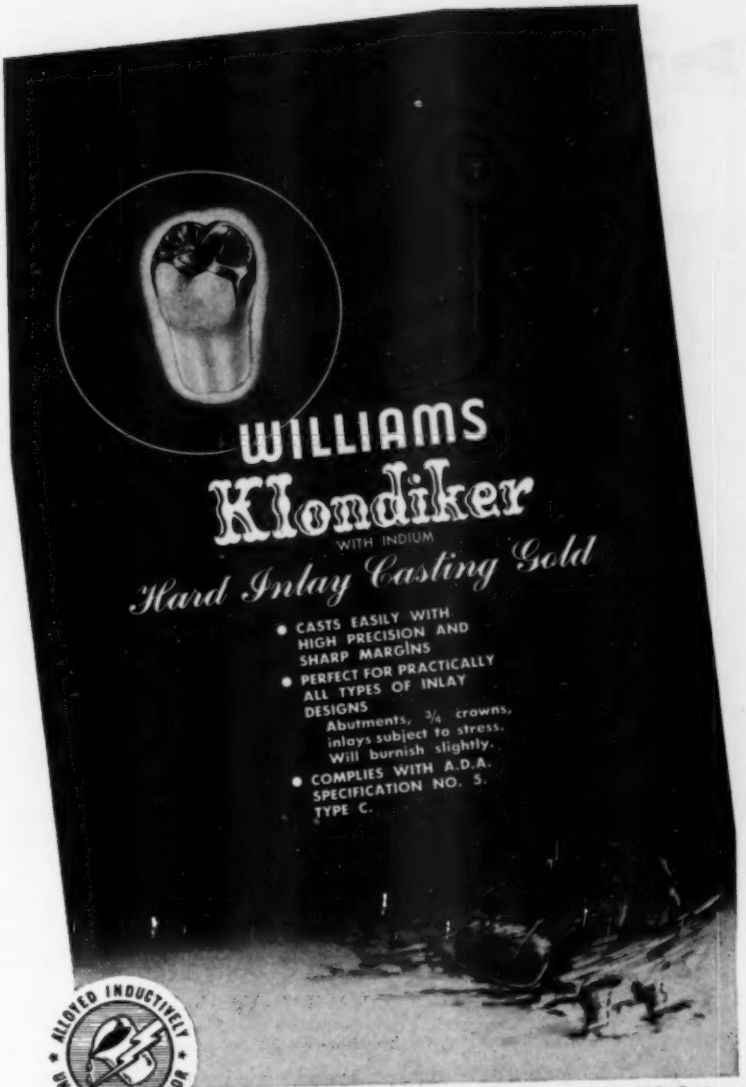
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APRIL 1950 • VOLUME 40 • NUMBER 4

PROBLEMS IN THE DIAGNOSIS OF CANCER WITH DENTAL SYMPTOMS

Orliss Wildermuth,* M.D., and Simeon T. Cantril,† M.D., Seattle

THROUGH education the dental profession has convinced the public of the value of periodic examination and demonstrated the worth of prophylaxis. This not only places the dentist in an enviable position for the discovery of early cancer, but also increases his responsibility, since very frequently in unsuspected cancer about the head and neck, the patient awaits the regular dental appointment to seek advice concerning his complaints.

Malignant diseases of the dental apparatus are recognized with a high rate of frequency and their descriptions are well recorded in the literature. In this paper, instead of listing neoplastic diseases of the oral cavity with their characteristic findings, we present specific traps that have caught the less wary in the maze of cancer diagnosis.

We would like to call the attention of the dentist to complaints which he may meet arising from cancer outside the oral cavity (antrum and nasopharynx) and likewise stress the opportunity to find cancer of the tongue in other than advanced stages. Our experience with these forms of cancer has impressed us with the frequency with which the dentist is first consulted. His awareness of these facts can do much for the patient. The following cases, with brief discussion, serve to point the problem. It is first necessary, of course, to think of cancer before its presence will be considered or recognized.

Cancer of the Antrum

Case 1.—C. F., an Alaskan fisherman, had always enjoyed perfect health until, at the age of 61, he became aware of right-sided nasal stuffiness. This progressed to complete obstruction in six months and was accompanied by an aching pain in the right maxilla, upper teeth and right ear. There was severe

*Trainee, National Cancer Institute, Tumor Institute of the Swedish Hospital.

†Director, Tumor Institute of the Swedish Hospital.

Photographs by Bernard Flagolle, photographer, Swedish Hospital.

lacrimation of the right eye at that time. After six more months during which these symptoms persisted, he consulted a dentist, who assured him that there was no disease in any of his full set of perfect teeth. Swelling of the right side of the hard palate was commented upon at the time. Five months later the same dentist was persuaded to extract the first right upper molar. Not only did the maxillary pain subside but complete anesthesia of the right cheek to the midline of the upper lip was observed following the procedure.

One month later, when he was 62 years of age, he came to the Tumor Institute, complaining of numbness of the right side of the face, constant pain in the right upper jaw and teeth, complete right nasal obstruction with a serosanguineous discharge, double vision, and lacrimation of the right eye. The voice had a nasal quality.

The swelling of the hard palate (Fig. 1) had been disregarded by the dentist despite the complete nasal obstruction and other symptoms of antral disease of six months' duration.

The facial anesthesia noted by the patient after the extraction could have been demonstrated months earlier. The amount of intra-antral pressure that will result in diffuse pain in the maxillary teeth will frequently be sufficient to cause edema, or pressure on the infra-orbital nerve and its alveolar branches, producing hypesthesia of the face and pain in the teeth. This important clinical finding is usually a surprise to the patient when it is elicited.

The dentist might have arrived at the diagnosis if laboratory services had been available and if he had followed the old advice of Bloodgood, re-emphasized recently by Martin,[1] namely to view with suspicion every fragment of tissue that clings to the roots of a tooth, and submit it for histologic study when no previously determined reason for it exists. Evidence supporting this contention was gained, in this case, by biopsy of the tissue filling the alveolus (Fig. 1), which revealed carcinoma of the maxillary sinus.

Cancer of the maxillary sinus can enlarge in all directions, erode through the confining walls of the antrum and produce more evident late signs. With superior extension, symptoms referable to

1. Martin, Hayes, Mouth Cancer and the Dentist, *J.A.D.A.* 33:845 (July) 1946.

Fig. 1.—Carcinoma of the right antrum (Case 1). Note the empty socket from which the biopsy was obtained, and the downward bulge of the hard palate

the eye are diplopia from elevation of the floor of the orbit, proptosis with orbital invasion, and lacrimation. Medial extension results in nasal stuffiness, discharge and bleeding after mucosal involvement. Lacrimation again is due to compression of the nasolacrimal duct rather than to irritation of the orbital apparatus. Anterior and lateral extension results in distortion of the face, while inferior erosion bulges the palate or may extend through the alveolar ridge as in Case 1. This situation in reverse—apical abscess as a cause of sinusitis—is a well-known process to the dentist.

Pain in the teeth will not only accompany erosion of the floor of the antrum, but even before erosion in any area is demonstrable roentgenographically, will be caused by pressure as the tumor increases in size. Thus, diffuse pain in the maxillary teeth, with unilateral cloudy antrum on the same side revealed by roentgenogram, must be considered neoplastic until proved otherwise. Sinus roentgenograms are always indicated here, and a unilateral opacity demands exploration of the antrum to obtain tissue for histologic study.

Trismus may occur with posterolateral erosion of antral carcinoma. Myositis of the anterior portion of the masseter muscle, because of the latter's origin from the zygomatic process of the maxilla, may result in trismus. Later there may be actual perforation of the tuberosity of the maxilla and extension into the infratemporal fossa and the fibers of the temporal muscle, causing trismus by invasion.

Prior to bone invasion, however, there is a period of months of increasingly severe diffuse maxillary tooth pain, which may bring the patient to his dentist. Suspicion of cancer, when no dental pathologic condition can be found will frequently lead to the discovery of facial hypesthesia. The recognition of this sign should lead to roentgenographic study of the sinuses. Unilateral sinus opacity then requires histologic diagnosis, even in the absence of roentgenographic evidence of bone destruction.

Cancer of the Nasopharynx

The pitfalls of diagnosis in tumors of the nasopharynx could be said to have no relation to dentistry. However, the fact that most of these patients are first seen because of complaints referable to metastases—usually enlargement of the cervical lymph nodes—means that every possible assistance in their earlier discovery must be solicited. The two cases recorded below indicate that sometimes the dentist is the first to be consulted.

Case 2.—R. H. complained of pain in the right upper teeth and consulted her dentist for a complete x-ray study. At that time there had also been frequent right-sided headache for six months and right earache for one month. No cause for the pain was discovered roentgenographically, and she was referred to a physician for a complete diagnostic study. Unfortunately the first internist she consulted was unable to establish the diagnosis and advised a recheck in a month's time if symptoms persisted. This was unsatisfactory to the patient and she tried elsewhere. In a matter of weeks she developed a bloody nasal discharge and received penicillin empirically. In another month the cervical lymph nodes became involved and she received more penicillin for suspected stubborn sinus disease. Two months later, with progression of all the symptoms, she returned to the original internist who was suspicious of the nasopharyngeal findings and referred her to a surgeon. The surgeon described the nasopharyngeal irregularity, but was misled by pus in the adjacent sphenoidal sinus. After a month and a half he took a biopsy specimen of the cervical lymph nodes and, a year after the pain in the teeth had led her to consult her dentist, the diagnosis of carcinoma of the nasopharynx was established.

Case 3.—The history of a recent blow to the jaw in football misled dentists and physicians whom a young man consulted for his complaint of trismus in September 1946. This 21-year-old athlete also complained of pain in the jaw on chewing, pain in the left ear, and some loss of hearing on the left. Roentgenograms of the head showed no fracture of the mandible. The trismus increased and a dentist suspected the third upper left molar and extracted it. Next, an oral surgeon planned to rest the temporomandibular joint, and wired the jaws for one month. The only result was progressive pain, twenty-five pounds' weight loss and increased trismus. By this time there was a change in the voice to a nasal quality and the patient was seen by two otolaryngologists in his home city and one on the other side of the continent. These specialists all followed the same line of thinking as the first therapist consulted—that the disease was of traumatic origin. One of them was most concerned about the pain in the ear and the loss of hearing. He found that the nasopharyngeal lymphoid tissue was enlarged and caused the adenoid voice, and that there was encroachment on the eustachian tube on the left. He therefore instituted radium therapy directed at the hypertrophied lymphoid tissue. The next doctor carried on and performed insufflations of the eustachian tube.

Meanwhile the pain was becoming worse and a neurosurgeon was consulted. After a detailed neurologic examination, the neurosurgeon treated the pain by block of the third branch of the trigeminal nerve, and there was prompt relief of the maxillary pain. The doctor was satisfied because he felt that the cause of the pain lay in that original red herring, the blow to the side of the head.

In late 1948 the patient was seen at the Mayo Clinic where the diagnosis of a nasopharyngeal tumor was obvious. By this time the metastatic involvement of the cervical lymph nodes was prominent evidence of the result of palliative treatment of symptoms without the establishment of the diagnosis.

The trismus in this instance was the result of direct extension into the internal pterygoid muscle at its origin in the pterygoid fossa.

Thus patients with nasopharyngeal cancer which has extended beyond the confines of the nasopharynx to invade the base of the skull, or spread anteriorly and inferiorly to the pillars, may complain of pain in the teeth or trismus. That these findings are little appreciated is evi-

Fig. 2.—Roentgenogram of base of skull (Case 2) shows destruction of the petrous portion of the right temporal bone where it forms the posterior boundary of the foramen lacerum. When compared with diagram showing the relationship of the roof of the nasopharynx to the cranial nerves, the dental symptoms of this disease become clear

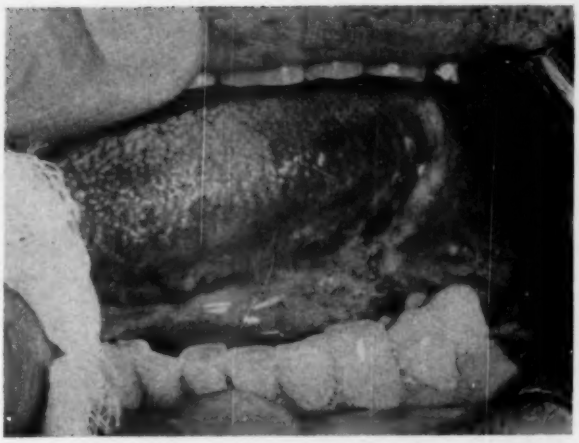

Fig. 3.—Carcinoma of the left inferior posterior border of the tongue characterized by minimal ulceration and extensive induration (Case 4). Note the site of teeth removed in hope of curing a traumatic disease

denced by the fact that about 80 per cent of patients already have cranial nerve involvement by the time the diagnosis is made. The fifth nerve at the gasserian ganglion, with its associated sensory branches supplying the teeth, is frequently one of the first of the cranial nerves involved. Actual destruction of adjacent bone in carcinoma of the nasopharynx is often demonstrable roentgenographically (Fig. 2).

Case 3 exemplifies the dangerous results of wanting to do something for a patient in spite of the lack of a diagnosis. Had the first dentist considered all of the possible causes of maxillary tooth pain without evidence of dental disease, the whole unfortunate sequence might have been avoided. If the first otolaryngologist had thoroughly evaluated the problem diagnostically from the signs and symptoms, and had looked for the common denominator rather than being satisfied to treat that phase of the syndrome with which he was most familiar, the disease might have been discovered in a curable stage.

Pain with a radicular rather than structural distribution which cannot be accounted for by local disease, may be treated symptomatically with the recognition that temporary relief of pain is the patient's right, but the etiology of pain should be sought.

Cancer of the Tongue

Case 4.—The three posterior teeth of the left mandible were removed by the dentist first consulted by H. B. This patient had consulted the dentist because for six weeks there had been a persistent soreness in the left posterior portion of his tongue adjacent to these teeth. Mouth washes were of no avail. The patient thought his trouble began with a bite which could not heal because swelling allowed recurrent trauma from the teeth and a vicious cycle had been established. The dentist extracted the teeth, but the lesion did not heal.

Two weeks later, when first seen at the Tumor Institute on the recommendation of a physician, the lesion had grown rapidly and submandibular lymphadenopathy was present (Fig. 3). Biopsy proved the cancerous nature of the disease.

Case 5.—O. W., after wearing dentures for nineteen years, decided to get a new set because recently they had seemed to

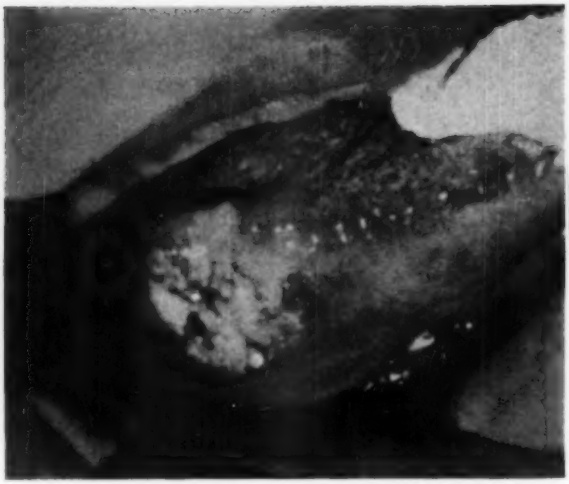

Fig. 4.—Carcinoma of the right margin of the tongue (Case 5). Note extension into the softer tissues of the floor of the mouth

fit poorly. The new plates were also unsatisfactory, but for the more specific reason that there was a cutting sensation on the right side of the tongue. In retrospect the patient could not be sure that the old dentures had bothered her in the same way. After six weeks' trial without relief, she persuaded her dentist to trim the edge of the dentures. However, the tender, firm area on the right side of the tongue persisted. The patient described the lesion a month later as being a "white coat with a brown center." Four months later, symptoms unabated, she consulted a physician who recognized cancer of the tongue. At that time the lesion was ulcerated and firm, and extended deep into the substance of the tongue and to the floor of the mouth (Fig. 4).

These two cases are presented as examples of lesions for which the professions were consulted by the patient in an early stage. Persuaded by the patient's interpretation of his complaint, the dentist may lose sight of the disease and seek to remedy a possible cause of discomfort the alleviation of which is familiar to him. Far more than in most malignant processes, time is a critical factor in cancer of the tongue. Observation of a suspicious lesion of the tongue without biopsy is rarely justified. Biopsy of this organ is little more complicated than its palpation, and should be considered a part of a thorough examination in any doubtful case.

Summary

Pain referred to the teeth, trismus, or the two combined, can accompany cancer of the antrum or nasopharynx. When the dentist is unable to account for trismus or pain in the teeth in his dental examination, he should rule out cancer of the antrum or nasopharynx. Since he may be the first one to be consulted, the opportunity for recognition of early cancer in these regions depends on his thinking of its possibility.

Cancer of the tongue is often associated with jagged teeth or ill-fitting dentures which give rise to chronic trauma. Complaints referable to the tongue should be scrutinized for the possibility of cancer, and biopsy recommended in all doubtful lesions.—*1211 Marion Street.*

AN IMPROVED ROENTGENOGRAPHIC TECHNIC FOR THE TEMPOROMANDIBULAR ARTICULATION

William J. Updegrave, D.D.S., Philadelphia

THE temporomandibular articulation has always been of special interest to the dental profession and particularly to those men following the specialties of orthodontics, prosthodontics and oral surgery. More and more the importance of this joint in the better understanding of its anatomic characteristics and its functional movements, both normal and abnormal, is being realized by the general practitioner when he is repeatedly confronted with patients who complain of audible crepitus, tenderness when palpated, pain upon mastication, restricted mobility, stiffness of joint with difficulty in yawning after long periods of inactivity, aural disturbances or other reflex symptoms which may be associated with some abnormal or pathologic change within the joint itself.

An indispensable aid in the diagnosis of abnormality or pathosis in this region is the roentgenographic examination, but here as in many other instances, the limitations of roentgenography alone must be recognized. Even the finest technic employed under the most favorable conditions may yield on the roentgenogram apparently normal-appearing joints which contradict the clinical observations. This is usually because the cartilaginous parts of the joint may be the site of the pathosis giving rise to changes which cannot be seen on the roentgenogram. In many instances osseous changes noted on the roentgenogram are a result of a long-existing condition which should have been detected and treated a long time before roentgenographic evidence was manifested.

The anomalies of dentition along with musculature, ligamentous or neurogenic conditions are all contributing factors to temporomandibular arthrosis, and the relative inefficacy of roentgenographic examinations in disclosing these conditions must be recognized. However, the technic of temporomandibular arthrography, as advocated by Norgaard,[1] in which a radiopaque contrast medium is injected into a single cavity of the joint and roentgenograms made in both open and closed mouth positions following which another injection is made into the other cavity of the same joint and roentgenograms taken in the same manner, is a technic which will demonstrate, to some degree, the cartilaginous changes within the joint itself. This procedure is no doubt very helpful in the hands of the experienced man, but would appear to be rather dangerous and of questionable value if attempted by the general dental practitioner.

The technic of laminagraphy is another method which can be used to demonstrate the joint. This method is of especial value in demonstrating a region or part relatively free of its surrounding structures, even though lying deeply within them. But here again this technic

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Note: Since this paper was presented, modifications and improvements have been made in the technic. Illustrated details of same can be obtained from the author.

Professor of Radiodontics, Temple University School of Dentistry, Philadelphia.

1. Norgaard, Flemming, *Temporomandibular Arthrography*. Copenhagen: Einar Munksgaard, 1947.

cannot be utilized in the average dental office since the apparatus required is of such specialization that ordinarily it can be found only in hospitals and institutions. Moreover only osseous changes are demonstrable with this technic, and it is seldom that the lateral projection laminagroph will be able to furnish any more essential information in reference to the joint than can be obtained with the technic presented in this paper.

Even though arthrography is the only technic which can demonstrate soft tissue changes in temporomandibular arthrosis, there is still much valuable information which can be obtained from roentgenograms demonstrating the osseous tissues of the joint. What but roentgenography can reveal the position of the condyle in the joint, its relationship to the joint cavity in open and closed mouth positions and in excursions of the mandible, the anatomic structure of the osseous tissues forming the joint and surrounding region, the size of the joint space and the comparison of both joints in similar mandibular movements, as well as any pathologic osseous change which may result in limited mobility of the joint? Furthermore, abnormal position of the head of the condyle as seen on the roentgenogram probably would indicate some strain or tension on the muscles or ligaments of the part which might account for the annoying reaction often associated with this joint. Therefore, if a simplified, proved, and standardized roentgenographic technic which will give consistently satisfactory results, and which can be utilized for routine repeated studies of the temporomandibular articulation by any dentist possessing the standard dental roentgenographic equipment, is presented to the dental profession, it is hoped that more and more roentgenographic studies will be made. In that event such a technic may lead to a clearer concept of the etiology and subsequent treatment of temporomandibular joint disorders.

The temporomandibular articulation is difficult to examine roentgenographically for two reasons: (1) the production of a considerable amount of secondary radiation due to the thickness of the part penetrated by the rays results in fog or haziness on the roentgenogram, and (2) because of the location of the joint directly beneath the base of the skull an unobscured view of the various parts becomes nearly impossible due to the superimposition of the intervening structures. These two difficulties combine to produce roentgenograms of poor quality, lacking definition and presenting added problems in interpretation.

In solving the first difficulty it must be remembered that when roentgenographic energy penetrates an object, some of the rays are absorbed, some pass through and some are scattered in all directions by the objects struck, very much as light is dispersed by fog. These scattered rays, which are known as secondary radiation, tend to produce a general haziness on the roentgenogram and thus obscure image detail. In roentgenography of the temporomandibular articulation, this secondary radiation constitutes a considerable part of the radiation that reaches the film; so, in order to reduce this annoying fogging factor, it is recommended that a lead shield or diaphragm with a small aperture be substituted for the conventional cone on the dental roentgenographic apparatus. This diaphragm can be easily constructed of sheet lead ⅛ inch thick and adapted to the dental machine in place of the cone (Fig. 1, left). An aperture 1¼ inches in diameter cut out from the center of the diaphragm will permit passage of sufficient direct primary radiation to the film, while most of the divergent radiation will be absorbed and the production of secondary radiation will be materially reduced (Fig. 1, right). The use of this diaphragm will lessen the effect of secondary radiation, thereby producing roentgenograms of superior quality (Fig. 2).

The second difficulty to be overcome is

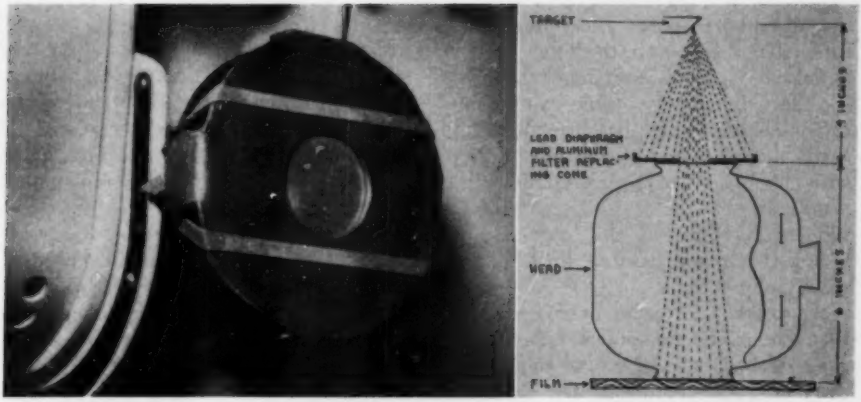

Fig. 1.—Left: Lead diaphragm and aluminum filter 1.0 mm. in thickness replacing cone of dental machine and held in place with heavy rubber band. Right: Diagrammatic drawing illustrating the limitation of divergent radiation by means of the lead diaphragm. This permits only the much-desired central rays to reach the film and materially reduces the production of secondary radiation. Note also that the target-film distance has been reduced to 10 inches, which reduction will produce good definition of the side being roentgenographed (adjacent to film) but considerable distortion to the opposite side due to 6 inch object-film distance

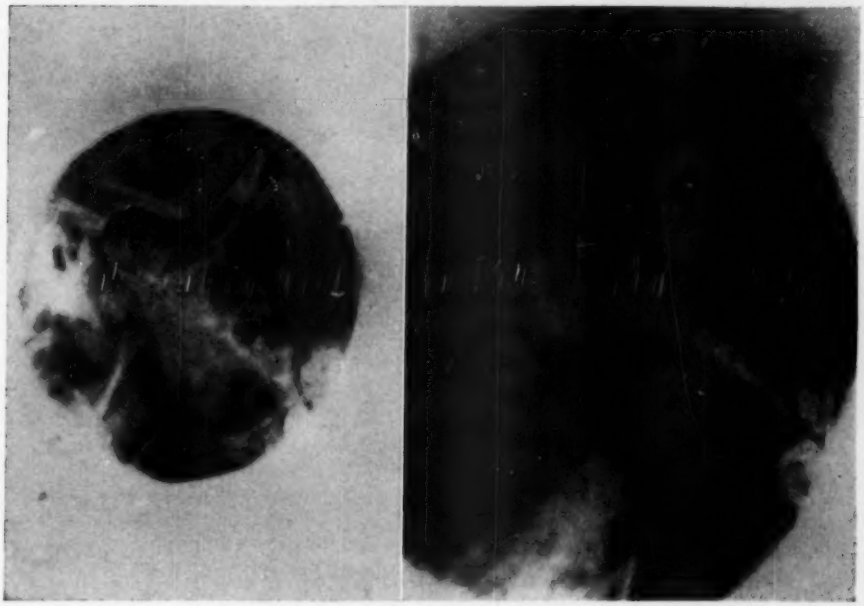

Fig. 2.—Two roentgenograms of same region illustrating the improvement in quality when radiation is limited. A. Exposure using lead diaphragm. B. Exposure without lead diaphragm

the superimposition of intervening structures of one side over the other. Proper angulation partially overcomes this problem; but if it were possible to eliminate the side not desired by distorting it to such a degree that it would not interfere with the side under examination, this problem would be solved. By altering the target-film distance, this objectionable factor of superimposition can be almost wholly eliminated.

A proved fact in roentgenography is that the closer the object being roentgenographed is to the film (object-film distance), the greater is the degree of sharpness or definition of the image on the film. Conversely, the greater the object-film distance, the greater is the loss of sharpness or definition (Fig. 3). It has also been proved that an increase in the distance between the focal spot on the anode and the film (target-film distance) will decrease distortion (magnification), while a shortening of the target-film distance will tend to increase distortion (Fig. 3). These factors are the basis of this simplified technic designed to eliminate superimposition when making roentgenograms of the temporomandibular articulation.

In the technic most commonly followed for roentgenography of this joint, the

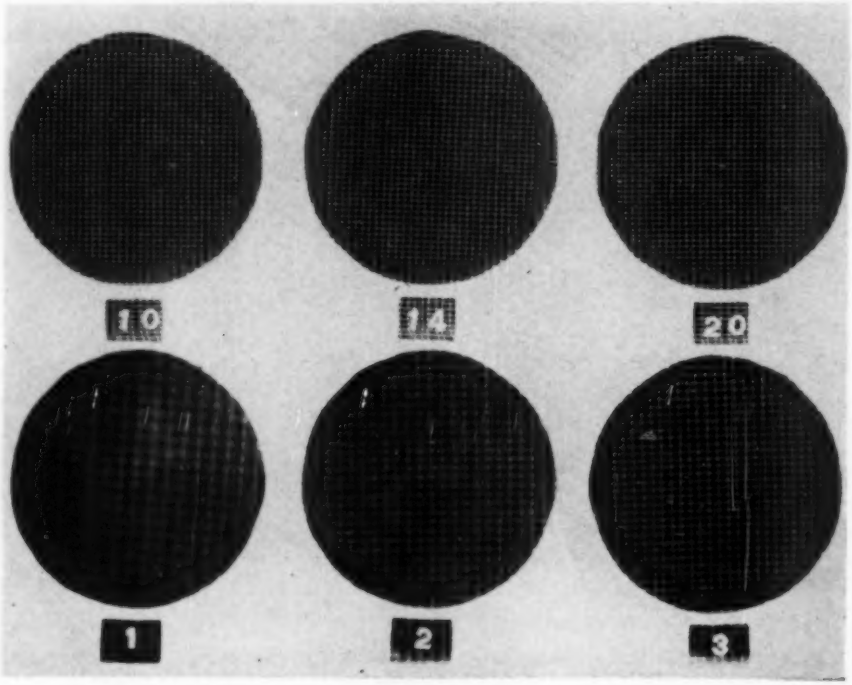

Fig. 3.—Top Row: Three roentgenograms of single wire screens using object-film distance of ½ inch. Bottom Row: Three roentgenograms of single wire screens using object-film distance of 6 inches. 1. 10 inch target-film distance. 2. 14 inch target film distance. 3. 20 inch target-film distance. Note the absence of distortion in top row regardless of increase in target-film distance, while in bottom row the increase in target-film distance reduces the distortion

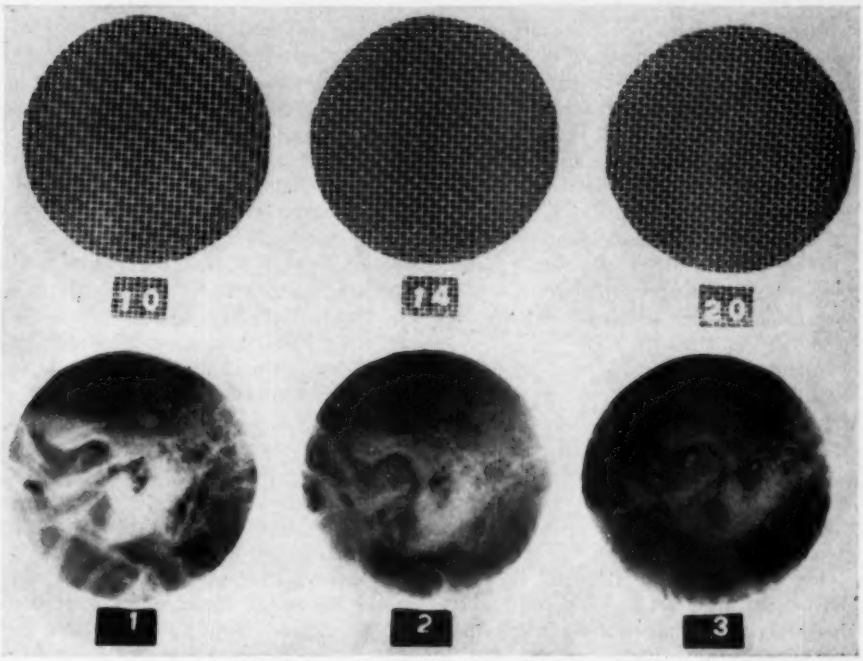

Fig. 4.—Top Row: Three roentgenograms of two wire screens placed in relative position corresponding to both temporomandibular joints using 10, 14 and 20 inch target-film distances as indicated. Note the 10 inch target-film distance shows considerably less evidence of two screens than the 14 inch and 20 inch target-film distances. Bottom Row: Roentgenograms of temporomandibular joint. 1. Target-film distance 10 inches. 2. Target-film distance 14 inches. 3. Target-film distance 20 inches

side to be roentgenographed is placed on a film which is angulated at 15 degrees toward the body by means of an angle board. The rays are directed at an angulation of 90 degrees to the floor from a point ½ inch anterior and 2 inches above the external auditory meatus of the opposite side, using a varying target-film distance of from 14 to 30 inches.[2-5] Analyzing this technic it will be noted that the object-film distance of the joint being roentgenographed is approximately ½ inch while the object-film distance of the opposite joint is 6 inches. The 14 to 30 inch target-film distance used in this technic is ideal for the side under examination since the object-film distance is only ½ inch and practically no distortion is evident; but this same 14 to 30 inch target-film distance also lessens the distortion produced by the 6 inch object-film distance of the opposite side and results in a more apparent superimposition with subsequent loss of definition (Fig. 4, above). However, it was found that by

2. Sante, L. R., *Manual of Roentgenological Technique*. St. Louis: St. Louis Book Distributing Co., 1938, pp. 89-91, 119.

3. McCall, J. O., and Wald, S. S., *Clinical Dental Roentgenology*. Philadelphia: W. B. Saunders Company, 1947, pp. 48-49.

4. Mustermann, H. W., *Principles and Practice of X-Ray Technic and Interpretation*. Brooklyn: Dental Items of Interest Pub. Co., 1945, pp. 79-82.

5. Riesner, S. E., Roentgen Technique for the Mandibular Joint, *Internat. J. Orthodontia* 23:740 (July) 1937.

reducing the target-film distance to 10 inches by replacing the cone of the machine with the lead diaphragm and filter and then positioning the machine directly on the side of the patient's head with the diaphragm approximating the skin surface (Fig. 5), the definition of the side being examined was not visibly affected, but the opposite side was distorted to such a degree as to render it practically indistinguishable on the roentgenogram, thereby producing the satisfactory results desired (Fig. 4, below).

In addition to improving the definition, the shortening of the target-film distance reduces the exposure time and makes it possible to employ slow-speed, high-definition intensifying screens which further improve the quality of the roentgenogram. The use of these slow screens is essential for best results in this technic.

The very important factor of safety to the patient must not be overlooked when the target-film distance is decreased since the intensity of radiation on the part is increased and unless a filter is employed to absorb the softer or less penetrating rays, a dermatitis or alopecia may result. According to McCall and Wald,[6] the safety dosage of roentgenographic energy which should never be exceeded on one area is 100 roentgens. With the aid of George C. Henny,[7] r meter readings were taken at this shortened target-film distance with these results:

Settings of machine at time of calibration—Voltmeter 110 V.

Milliamperes	12
Kilovolts	63

Plastic cone replaced with lead diaphragm with aperture 1¼ inches. Measurements made in air (without back scatter) at a distance of 1 cm. beyond the diaphragm aperture.

Filter added	*r per 5 second exposure*
None	59
0.5 mm. aluminum	33
1.0 mm. aluminum	22.3
1.5 mm. aluminum	17.1
2.0 mm. aluminum	14.4

It can be seen, therefore, from this data, that the adoption of a shortened target-film distance technic necessitates the employment of a protective filter, and an aluminum filter 1 mm. in thickness is recommended. This can be used with the lead diaphragm (Fig. 1, left) and will give optimum protection to the patient with minimum interference to image production.

Additional requisites for carrying out this technic are a 15 degree angle board and a head stand or table large enough to accommodate it. This angle board can be easily constructed and should be a minimum size of 17 inches long by 12 inches wide to allow for the shifting of the cassette. The board should have a vertical line marked on it dividing it in two and a horizontal line marked on it corresponding to the horizontal marking on the face of the cassette when resting on the board. Receptacles for removable metal rods should be placed on the sides of the board at both extremities of the horizontal line and at the top of the board at the end of the vertical line. The rods which fit into these receptacles are valuable aids in attaining proper alignment of the machine and patient (Fig. 6).

6. McCall, J. O., and Wald, S. S., *Clinical Dental Roentgenology*. Philadelphia: W. B. Saunders Company, 1947, pp. 66-67.

7. Professor of Medical Physics, Temple University School of Medicine, Philadelphia.

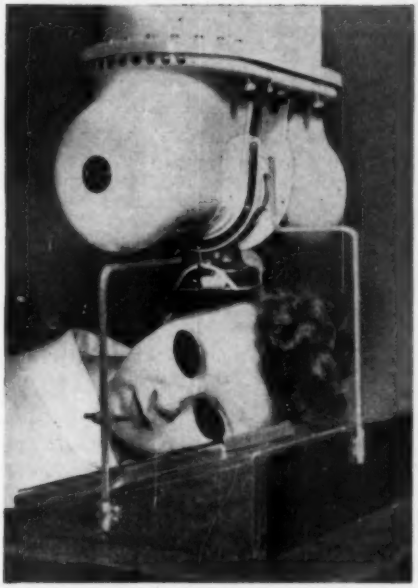

Fig. 5.—Close-up of technic illustrating the close position of machine to patient's head reducing the target-film distance to 10 inches. Note the lead mask on the cassette which protects half the film to permit two exposures on film and the removable rods which aid in the alignment of the machine, joint and film

Another important essential in this technic is the careful positioning of the patient in relation to the film, and an aid in securing this relationship is the marking of a sheet of paper 8 by 10 inches as indicated in Figure 7 and attaching this to the face of the 8 by 10 inch cassette. Then by covering half of the cassette with a lead sheet, the markings on the opposite half can be aligned with those on the angle board, the joint can be centered and the rays can be directed to cover the joint region under examination. The same procedure can then be repeated on the opposite half of the film by moving the lead sheet, to protect the exposed half of the film, by realigning the markings on the cassette and angle board and making a second exposure (Fig. 8).

Technic

The table with the angle board is placed at the side of the dental chair and the patient is seated facing the board. The specially marked cassette, equipped with slow-speed intensifying screens, is loaded with regular screen film, half of the cassette is covered with the protective lead sheet and the other half is aligned with the corresponding lines on the angle board. A small cone of very soft wax is placed on the horizontal line marked on the cassette at a point ¾ inch distal to the cross-line point where the joint will be positioned. The side of the head of the patient which is to be roentgenographed

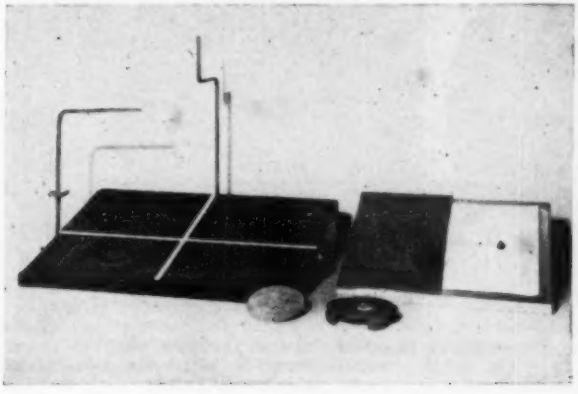

Fig. 6.—Accessories used in technic, from left to right: 15 degree angle board with horizontal and vertical markings and removable rods, 1.0 mm. aluminum filter disk, lead diaphragm, 8 by 10 inch cassette showing left half covered with protective lead mask and right half with alignment markings. Note soft mound of wax to right of vertical line which guides positioning of the external auditory meatus

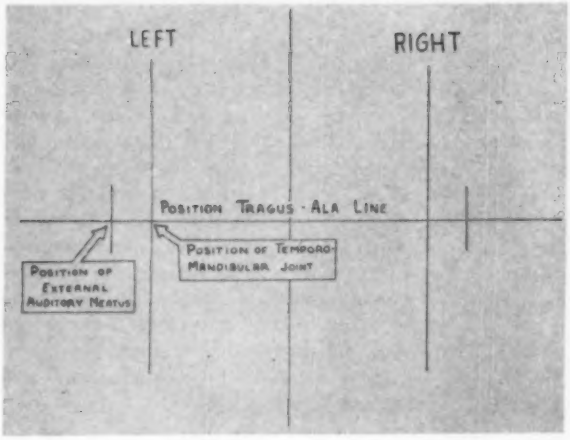

Fig. 7.—Position markings on paper (8 by 10 inch) attached to face of cassette to aid in positioning of head. Temporomandibular joint — 2¼ inches from center line. External auditory meatus—3 inches from center line

is then placed on the cassette with the external auditory meatus positioned over the wax cone and the tragus ala line of the patient aligned with the horizontal line marked on the cassette. No effort is made to parallel the sagittal plane of the patient with the film plane since results have been more satisfactory by allowing the head to assume a comfortable position with the side of the jaw lying flat on the film and the tip of the nose assuming a position of 2 to 2½ inches off the cassette (Fig. 9). An adjustable horizontal rod can be attached to the vertical rod positioned at either end of the horizontal line of the angle board, which rod can be adjusted and height recorded for position of nose tip of patient so that all roentgenograms can be made with the head in the same position (Fig. 5). This is essential

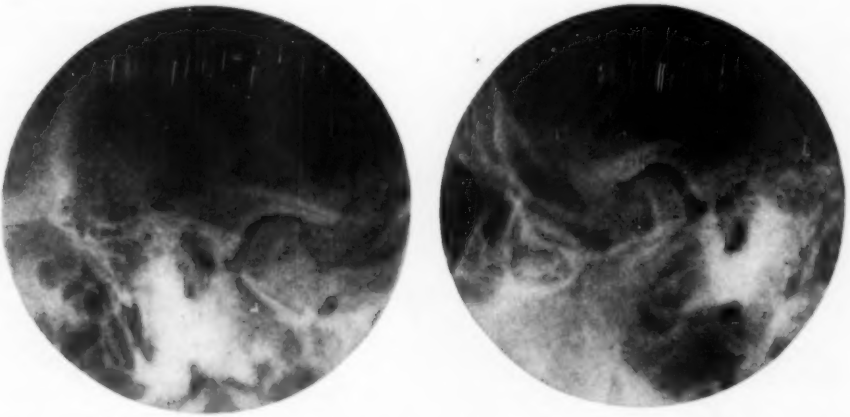

Fig. 8.—Left and right temporomandibular articulation on one film demonstrating results obtained by substituting a lead diaphragm for the cone, shortening the target-film distance and using slow-speed, high definition double intensifying screens

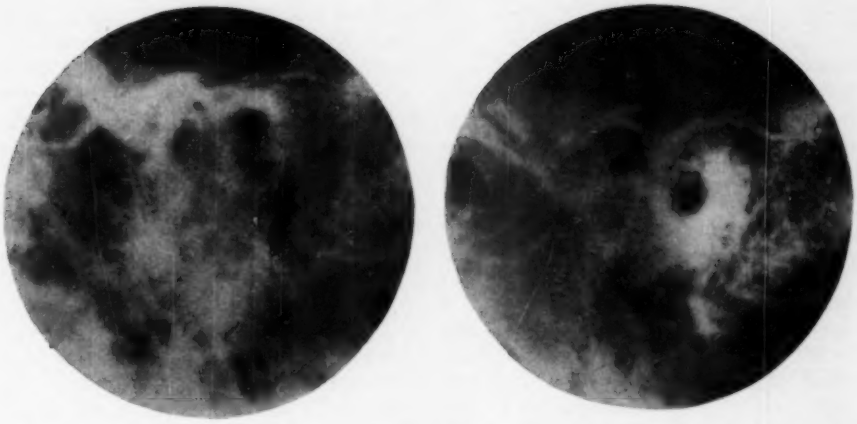

Fig. 9.—Left: Roentgenogram of temporomandibular articulation with sagittal plane parallel to film. Right: Roentgenogram of temporomandibular articulation with side of jaw lying flat on the cassette, making no attempt to parallel sagittal plane and film

Fig. 10.—Photograph of technic demonstrating position of patient in relation to table, angle board and cassette. Note the alignment of the machine to the guiding rods and the adjustable horizontal rod which aids in duplicating head positions

to produce uniform results and thus to make useful the comparison of the roentgenograms.

The machine, with the cone replaced by the lead diaphragm and aluminum filter, is then positioned in contact with the head at an angulation of 90 degrees and aligned longitudinally and vertically with the rods on the angle board. Since it is difficult to direct the rays from the small opening of the diaphragm, and since there is no cone to guide the operator, it is strongly recommended that particular attention be given to the alignment of the cassette on the angle board, the patient to the cassette and the tube to the guiding rods on the angle board. By centering the horizontal and vertical axis of the tube with the corresponding horizontal and vertical line rods of the angle board, it is certain that the central rays will strike the joint and film at exactly the points indicated by the cross-lines on the cassette (Fig. 10).

Care should be exercised to indicate the right side from the left on the film; and this can be accomplished by the use of lead letters.

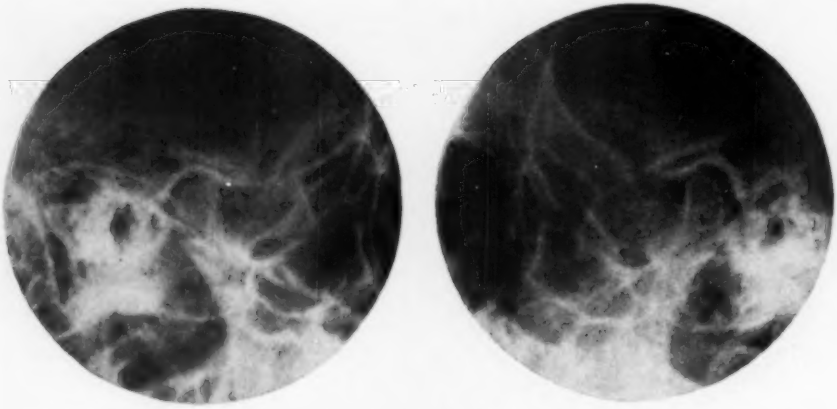

Fig. 11.—Left and right temporomandibular joint with jaws in centric relationship

The exposure time varies for different individuals but the average exposure required using a 10 milliampere 60 kilovolt dental machine at a 10 inch target-film distance with slow-speed double intensifying screens is 3 to 4 seconds.

In the study of the temporomandibular articulation, it is usual to show it in both centric and open relationship (Figs. 11 and 12), the recommended opening being 1.25 inches.[5] The accepted method of opening has been to insert some object of the required thickness between the incisor teeth of the patient upon which he closes and maintains the desired opening while the roentgenograms are being made. It has been my experience that in many instances when a single object is used between the incisor teeth of a patient, there is a tendency for a protrusive movement of the mandible which does not give a true picture of the joint in nor-

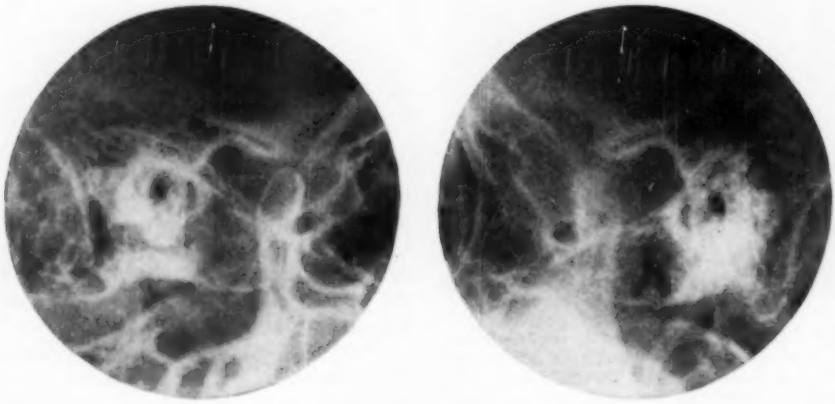

Fig. 12.—Left and right temporomandibular joint with jaws in open relationship

mal opening. In order to avoid this it is recommended that a pair of small hard rubber mouth props be substituted for the single prop between the incisors. Have the patient open normally to the required distance and then insert the props on both sides in such a manner that the posterior teeth are supporting the mandible. This method will give a truer picture of the joint in normal opening.

Comment

It is hoped that the effort of this paper to simplify and standardize a technic which has in most instances given more difficulty than any other roentgenographic examination required of a dentist will not be fruitless, but that the simplicity of the technic along with the assurance of consistently good results, will incite a greater interest among the general practitioners to roentgenograph and investigate troublesome temporomandibular articulations, and that perhaps from these investigations a clearer concept of both the causes of joint disorders and their subsequent treatment may develop.

Summary

1. A better understanding of the temporomandibular articulation is demanded of dentistry and a simplified standardized roentgenographic technic for the part is a step toward that goal.

2. The technic should be practicable by the general dental practitioner possessing regular dental roentgenographic equipment.

3. The primary difficulties in roentgenography of the temporomandibular articulation are caused by secondary radiation and anatomic position of the joint.

4. The substitution of a lead diaphragm for the cone will reduce the secondary radiation, while the employment of an angle board and the application of a shortened target-film distance will produce less superimposition and a clearer presentation of the joint.

5. The lessening of the target-film distance requires the use of a 1 mm. aluminum filter as a necessary precaution against tissue injury by the rays.

6. The use of slow-speed high-definition double intensifying screens improves the quality of the roentgenograms.

▲

Past, Present and Future.—"The present is in every age merely the shifting point at which past and future meet and we can have no quarrel with either." In these words of Havelock Ellis there is contained the germ of an inspiration which should find lodgement and growth in the consciousness of all who are deeply concerned with life. They express the true conception of what men call vision. This means literally seeing backward, seeing now, and seeing forward, and then harmonizing the relations of each objective. Just as in ocular vision one does not actually see with the eye but rather with the brain, so in the larger realm vision depends on the higher faculties of intelligence, discernment, and understanding.—*Hubert Ashley Royster, "A Century and a Half of Medicine in North Carolina," North Carolina Medical Journal 10:394, August. 1949.*

THE APPLICATION OF SOUND BIOMECHANICAL PRINCIPLES IN THE DESIGN OF INLAY, AMALGAM AND GOLD FOIL RESTORATIONS

Rex Ingraham, D.D.S., Hollywood, Calif.

THE restoration of a tooth, be it with gold, amalgam, porcelain, or any other acceptable material, can be no better than the preparation designed for it. The cavity prepared to receive an amalgam restoration should be designed to complement the properties of the alloy; the preparation of a tooth to receive a gold inlay should not only be designed to gain perfection of margins and restore occlusion, but should be engineered to augment the strength of the tooth as well; the preparation of a tooth to receive a gold foil restoration should be planned to harmonize with the contours of the tooth for esthetics and yet provide convenience for the placement of the foil. Good cavity preparation is the foundation for successful operative dentistry.

If an operative procedure is to be a success, the dentist must have clearly fixed in his mind all fundamentals which constitute the finished operation. Success is measured; first, by the safeguarding of the pulp; second, by the efficiency with which lost tooth structure is replaced and recurrence of caries prevented; third, by the restoration of masticatory function; fourth, by due consideration of esthetic requirements; and last, but by no means least, by the reproduction of tooth form and contour to promote and maintain tissue health.

The purpose of this article is to emphasize the importance of the preparation in relation to the finished restoration. Integrity and courage on the part of the operator to meet these exacting requirements are, of course, essential.

There has been a tendency to minimize the importance of cavity preparation. Relegating this phase of our work to the background may be the result of the trends of this mechanical age. That short cuts and spectacular new gadgets apparently occupy the position of greatest importance with many operative dentists today is well borne out by articles in dental journals and programs presented at dental meetings. In both instances, attention is focused upon new technics and upon the development of highly specialized equipment for the manipulation of materials. The essayist frequently receives a cool reception if he confines his presentation to fundamentals of cavity preparation, which represents the basis for the practice of sound operative dentistry. However, if he chooses to demonstrate some gadget which may have nothing but novelty to offer, or some innovation in procedure, he is certain to get enthusiastic attention. These clinics often have merit and do contribute to the advancement of dentistry, but we must not let the trees conceal the forest.

Commercialism also can be seen as a factor in this present day trend. Dentistry is plagued by this serious problem, which has always existed to some extent. Un-

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Professor of Operative Dentistry, University of Southern California, School of Dentistry.

scrupulous commercialism and policies of supersalesmanship are being practiced upon the profession by some dental manufacturers today. An example of such unjust practice is the advertising and promotion of siliceous cements as a posterior filling material. Unfortunately, thousands of dollars worth of this inadequate material is sold to the profession each year. Still another example is evidenced in the case of one of our large tooth manufacturing companies. After building one of the foremost reputations in the world for fine dental porcelains, it is now using its established reputation to promote the widespread use of acrylic resins for bridgework and for other operative procedures, even though acrylic in its present state falls far short of fulfilling the necessary requirements for such usage. It is high time that more effective action be taken by the profession to protect itself from unjust promotion of materials that lower professional standards. Real advances in dentistry can be made only through well directed teaching programs in our undergraduate and graduate courses, and through subsidies to the dental profession for research—not by the dictates of manufacturers. It would be well if manufacturers profiting from the profession by the marketing of dental supplies were to allocate a fair share of these profits to research by the dental profession and not to the exclusive promotion of their own research programs which are too often highly influenced by their commercial interests.

Although dentistry must be precise and exacting in results, it cannot be classed as an exact science. Each operation is an entity and presents individual problems which call for the exercise of judgment, ingenuity and skill by the operator. However, the dentist must realize that the decisions in any case rest upon definite fundamental principles if his efforts are to be successful. A knowledge of these principles is essential for intelligent planning of cavity preparation, no matter what the deviations from the normal may be.

It behooves us, as a profession, to consider carefully the consequences of this trend away from the fundamental principles of cavity preparation. We must allot this more tedious phase of our work a fair proportion of our attention. A beautifully fitted inlay or a well-finished amalgam restoration is of little value to the patient if it fails through lack of some basic requirement. Haphazard cavity preparation is probably the most common cause for the failure of restorations, no matter what filling material is used. The practice of operative dentistry involves biologic as well as mechanical problems and we cannot neglect either for long without invoking damaging consequences. If the tremendous strides that have been made toward improvement of mechanical procedures in operative dentistry are to be of the greatest possible value, then this progress must be correlated with an equally energetic effort toward a keener understanding of the biomechanical engineering involved in cavity preparation.

Cavity preparation was first elevated to a systematic science with the publication of Black's fundamental orders of procedure. The profession's universal acceptance of these simple and effective fundamentals was the first step toward a scientific method of preparing teeth. These rules form the foundation upon which our work is based and must be applied to every cavity that we prepare. However, the materials which we use to restore lost tooth structure introduce variables in the details of our cavity preparation.

Amalgam

Failures of amalgam restorations cannot usually be blamed on the material but rather on a lack of understanding by

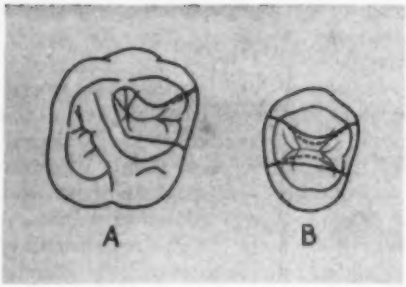

Fig. 1.—A: Occlusal view of upper molar illustrating outline for Class II amalgam restoration. Dotted line forms acute angle with proximal surface of tooth. While this is permissible for an inlay restoration, it would be undesirable for amalgam. B: Solid lines indicate desired extension of isthmus portion of amalgam cavity (⅓ of buccolingual breadth of occlusal surface) to allow for sufficient bulk of material at this point to resist fracture. Dotted lines illustrate common error of underextending this portion of cavity outline

the operator of the basic principles of the preparation in relation to the physical properties of this alloy. Amalgam is relatively weak and has little edge strength in comparison with other materials. These facts make it necessary to provide for more bulk of material in certain portions of the cavity and to make sure that no weak edges of the alloy are left which will tend to fracture. Therefore, the outline of the cavity, as well as the internal form, will vary in accordance with these requirements. Too often friability of amalgam is overlooked and the operator fails to extend the isthmus portion of the cavity to allow for sufficient bulk of material to resist fracture. Black states that in the preparation of proximo-occlusal cavities there is usually room to occupy one-third of the buccolingual breadth of the occlusal surface in a step, without interfering with recessional lines or the pulpal horns, provided the step is not cut unnecessarily deep. This extension provides for sufficient bulk of amalgam to resist the heavy shearing stresses of mastication. However, the most common point of fracture for Class II amalgam restorations occurs at the acute buccal angle of the marginal ridge. Fracture of this weak margin often occurs even during the removal of the matrix and when carving the marginal ridge of the filling. This fault can be greatly minimized by designing the bucco-occlusal wall of the cavity to approach the proximal at as nearly a right angle as possible, thus affording greater bulk of filling material at this point. (See Fig. 1.)

Another property of amalgam that must be considered when planning a cavity preparation is that of flow. Both clinical observation and scientific information offer proof that amalgam continues to flow when subjected to masticating forces. Therefore, it becomes obvious that more consideration must be given to the design of the internal resistance and retention features of the cavity. Insufficient retention in the proximal portion of the cavity results in gradual flow of the amalgam beyond the margins, leading to an early failure of the

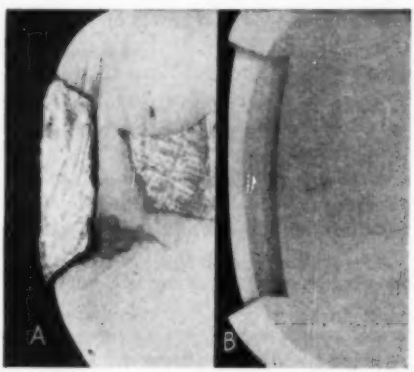

Fig. 2.—A: Extracted tooth with faulty Class II amalgam restoration. Horizontal section, through middle one-third of crown, illustrates lack of retention in proximal portion of preparation. B: Similar section of large plaster model illustrates desired undercut of proximal box forms of cavity to lock amalgam into this portion of preparation

restoration. The buccoproximal and linguoproximal walls of an amalgam cavity should present definite undercut box forms (Fig. 2) extending from approximately the height of the occlusal step to the gingival floor of the cavity, similar to that of the gold foil restoration. Likewise, the axiogingival line angle connecting the buccal and lingual box forms should be accentuated with an angle former or margin trimmer, to tie the amalgam into the gingival portion of the cavity (Fig. 3).

The fact that we are working with vital tissue must be kept in mind. The principle of conservation of dentin in accordance with sound mechanics must be adhered to. The object should be to make cavities only deep enough to give bulk and stability to the filling, except as deeper excavations are required for the removal of decayed material. Where excessive dentin is lost through caries, the placement of a base is imperative to prevent injury to sensitive pulpal tissue. The practice of placing deep fillings without the insulation of a base can be a contributing factor in degenerative processes of the pulp.

A critical examination of the many

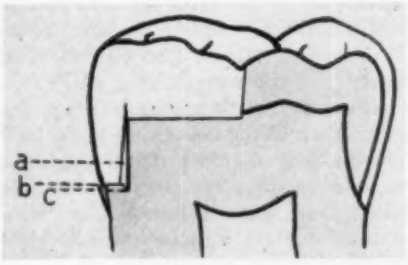

Fig. 3.—Mesiodistal section of molar with Class II amalgam preparation. Accentuation of axiogingival line angle at (c) locks amalgam into gingival portion of cavity. Undercut buccal (a) and lingual box forms also provide mechanical locks for amalgam in this portion of cavity. Desired cavo-surface finish of gingival margin of preparation is indicated at (b). Flat gingival floor and occlusal seat of cavity provides resistance to dislodging forces

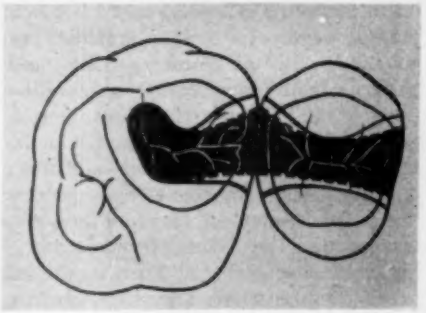

Fig. 4.—Insufficient extension of proximal cavity walls for convenience and for placement of these margins into self-cleansing areas is a common cause for the failure of proximo-occlusal restorations. The dark area within the broken line illustrates underextension of proximal cavity walls while unbroken lines indicate desired extension of these walls

failures of proximo-occlusal restorations indicates that perhaps the most common cause is the lack of sufficient proximal extension of cavity walls. Extension for access, or convenience to the operator, must be made, whatever the existing conditions may be, if the restoration is to be permanent. There will be failures in proximal fillings, regardless of the patient's attention to mouth hygiene, if cavity margins are so underextended that the operator cannot properly place and finish the restoration. One of the most significant advances in operative dentistry would be the realization of the full import of this principle (Fig. 4).

Gold Inlay

Gold alloy, by nature of its physical properties, differs greatly from amalgam. While amalgam must rely upon surrounding walls for support, this is not necessarily true of the gold inlay. The inlay should, whenever possible, impart strength to remaining tooth structure by binding together its component parts. Its toughness and high tensile strength permit the making of restorations that will

resist forces of mastication to a much greater degree than does amalgam or gold foil. Also tooth form can be more perfectly and more readily restored by the gold inlay than by any other material.

Hollenback has stated[1] that it can be said, without fear of contradiction, that it is now possible for even a comparatively inexperienced person to reproduce any wax pattern, regardless of type, with a high degree of accuracy. Even so, the inlay as a restoration for lost tooth structure has proved only moderately successful in the hands of many in the profession. Therefore, if the fundamentals of casting and investing essential to obtaining constantly accurate inlay castings are available to every man in the profession, it can be assumed that one of the most logical steps toward reducing the failures of the gold inlay is the correction of fallacious concepts of cavity preparation. Lack of knowledge and failure to apply basic fundamentals in a scientific and craftsmanlike manner to the inlay cavity have placed this restoration in questionable repute with many in the profession. One has only to observe the numerous and devastating failures to understand this. These failures for the most part are the result of unsound biomechanical engineering in cavity design.

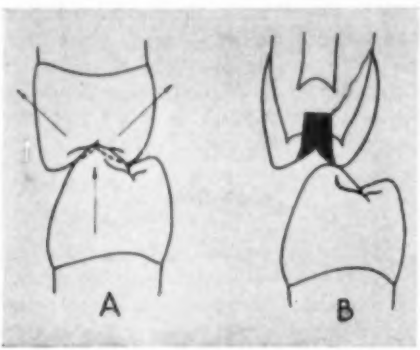

Fig. 5.—A: Natural anatomic form of posterior teeth, with their cusps and sulci, is a design which creates a tendency under stress to spring the cusps apart. B: While sound teeth seldom fracture from ordinary stresses of mastication, such fracture is not uncommon in teeth subjected to customary placement of fillings

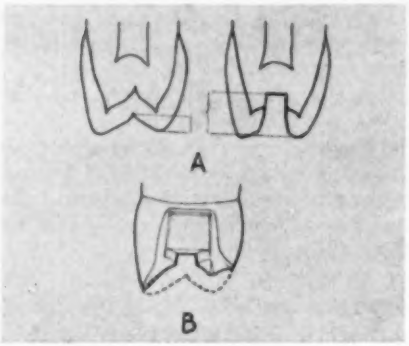

Fig. 6.—A: Effect of orthodox cavity preparation is to increase cusp heights almost three times. B: Capping the cusps can be done almost entirely at the expense of enamel and tends to tie the structural elements of the crown more tightly together and places the margins into areas where stresses cannot bear directly into them

For a successful gold inlay, one of the most significant requirements is the principle of "extension for convenience." The highly variable qualities of our inlay waxes alone demand, in teeth normally aligned, that ample access to or beyond the angles of the tooth be provided to facilitate the carving and removal of an accurate wax pattern. Likewise, the final finishing of the margins of a casting on the tooth figure strongly in the life of the restoration. Being aware of these facts and knowing that the slightest discrepancy of an inlay margin may result in failure, we must conclude that it is essential for the operator to allow for convenience commensurate with his individual ability to work efficiently. If a restoration fails by reason of the dentist's inability to work efficiently within confined areas, then he has not conserved

1. Hollenback, G. M., Simple Technic for Accurate Castings: New and Original Method of Vacuum Investing. *J.A.D.A.* 36:391 (April-May) 1948.

tooth structure, but his poor judgment has been a factor in destroying it.

The design of the typical proximo-occlusal inlay cavity presents another definite inconsistency. Smith and Potter[2] have stated that the preparation of a cavity in the occlusal surface seriously weakens the structural design of a tooth. The natural anatomic form of posterior teeth, with their cusps and sulci, is a design which creates a tendency under stress to spring the cusps apart (Fig. 5A). While sound teeth seldom fracture from the ordinary stresses of mastication, such fracture is not uncommon in teeth which have been subjected to the customary placement of fillings (Fig. 5B). Mechanically, the general effect of the orthodox cavity preparation is to create extremely long cusps rising above the restoration with reduced supporting dentin. The surfaces of these cusps rising above the restoration are subjected to stresses which tend to bend or fracture them at their point of attachment with the pulpal floor of the preparation. The small occlusal portion of the typical inlay restoration becomes, in effect, a wedge between the cusps of the teeth. The orthodox preparation produces a cusp height almost three times that of the original cusp (Fig. 6A). While an actual fracture may not be created, the springing of the cusps may open the margins of the fillings and induce failure.

The tendencies of stress to cause fracture can be reduced by sound engineering principles in cavity design. Capping the cusps of the teeth tends to tie the structural elements of the crown more tightly together and allows the margins to be so placed that stresses cannot be brought to bear directly into them (Fig. 6B). By the use of long bevels, the margins will be carried to a position where stresses sweep the food from the gold over the tooth, forcing the margins more closely together. Experience has proved that the veneer principle lends itself to the best advantage in enhancing the strength of a tooth because its design is engineered to produce a binding rather than a wedging effect.

If this be true, the design of an inlay should approach that of the veneer principle as closely as possible. Covering the crests of the cusps with gold may be accomplished almost entirely at the expense of enamel. Thus the hazards incident to leverage and pulp irritation are largely reduced. These extended occlusal surfaces of the restoration also reduce the frequency of failure due to abrasion, erosion, and fracture of unprotected enamel margins. Where the cusps cannot be capped, abraded areas should always be included within the outline of the inlay, with a substantial thickness and bulk of metal over these areas for support. See Figure 7.

The cavity preparations described by Black were predicated upon the use of gold foil. According to his statements, he recognized the elasticity of dentin as a major factor in the retention of the material. His contributions were years ahead of his time and he must be credited with having been extremely progressive in thought. Had the inlay been in universal use in Black's day, it is probable that he would have recognized the hazards of the flexibility of dentin in an inlay preparation. Doubtless he would have advocated modifications in cavity preparation whereby the properties of the material could be better adapted to enhance the strength of the tooth.

The cavity preparation for a cast restoration must be prepared with ample draft in the contemplated direction of withdrawal. This eliminates undercuts but does not prevent the cavity from having the utmost in resistance and retentive forms. A well-designed cavity will successfully retain an inlay under all conditions. The inlay preparation (Fig. 8) should employ proximal box forms for retention and flat pulpal and gingival

2. Personal communication.

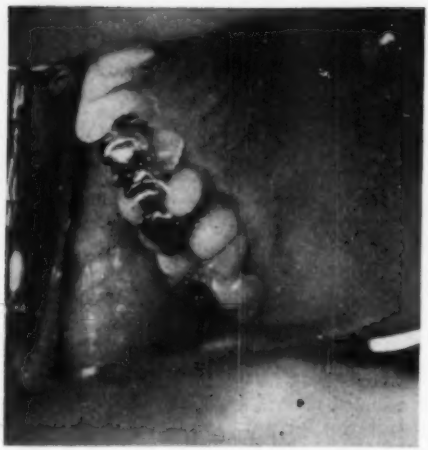

Fig. 7.—Fracture of lingual cusp of this maxillary first biscuspid occurred some time after placement of M.O.D. inlay of orthodox cavity design. No protection was provided for the crests of the buccal and lingual cusps. (Courtesy of Dr. Harry R. Potter, Los Angeles.)

floors for resistance to dislodging forces. Such forces may be extremely great, which indicates the importance of providing sufficient resistance and retentive forms in our cavity design to alleviate the tendency of an inlay to be dislodged. The access provided by the box form of the preparation permits the use of ample trussing beams in the inlay to resist springing or bending under vertical biting forces.

Most slice-cut preparations, having neither the proximal box form for retention and bulk nor the flat gingival seat for resistance to dislodging forces, must rely upon excessively deep occlusal portions for bulk and extremely hard gold for strength. Such deepening of the occlusal portion of the cavity violates the cardinal principle of conservation, inviting degeneration of the tooth pulp. The use of extremely hard golds on occlusal surfaces is incompatible with normal tooth wear and will result in hyperocclusion and periodontal disturbances after a period of time.

Still another fallacy of the slice-cut preparation is the undue extension of the proximal walls beyond the embrasures to include the height of convexity of the crown, while the extensions at the proximogingival angles of the cavity are so limited as to invite recurrence of caries due to lack of extension for immunity and for sufficient access to carve the pattern properly and finish the casting (Fig. 9). If these preparations are employed solely for the purpose of shortening and simplifying the operation for the dentist —and apparently this is true—then there is little justification for their use. The slice-cut preparation certainly falls far short of the fundamental requirements of an inlay from the standpoints of good biomechanical engineering, esthetics, and so forth. (See also Fig. 10.)

Gold Foil

The virtues of gold foil as a restorative material have been for many years a

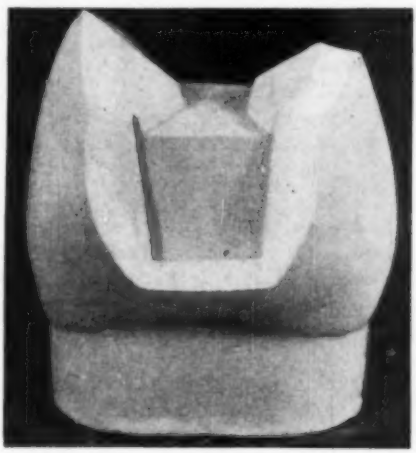

Fig. 8.—A well-designed inlay cavity employs flat pulpal and gingival floors for resistance to dislodging forces and proximal box forms for retention. These features in cavity design permit ample trussing beams of gold to resist springing or bending under vertical biting forces

matter of controversy among practitioners throughout this country. It has been largely through the conscientious efforts of isolated study club groups under the early guidance and inspiration of such men as Black and Johnson, and through the later refinements and innovations introduced by Prime, Woodbury, Ferrier, Jones, Baird, Metcalf, True, Rule, and others, that the art of dental restoration with gold foil has been perpetuated and advanced.

Once an operator has attained proficiency in the use and placement of gold foil, it becomes his faithful and indispensable servant. The meticulous attention he must give to details in the perfection of gold foil technics is reflected by a distinct improvement of all other dental procedures. However, the practitioner who fails to acquire a thorough knowledge of the fundamentals of gold foil cavity preparation and fails to master simplified and effective technics for the placement and finishing of gold foil, quickly abandons its use. By so doing, he eliminates from his practice a most lucrative source of income as well as one of the most effective services it is possible to render a patient.

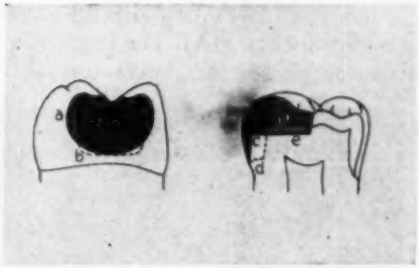

Fig. 9.—Slice-cut preparation results in undue proximal extensions beyond embrasures to include height of convexity of the crown at (a). At the same time there is a limiting of extensions at the proximogingival angles of the cavity at (b) which invites recurrence of caries due to lack of extension for immunity. Since the slice-cut preparation has no flat gingival seat for resistance such as that indicated by dotted line at (d), it must rely upon deeper occlusals as indicated at (c) for bulk, and on extremely hard golds for strength

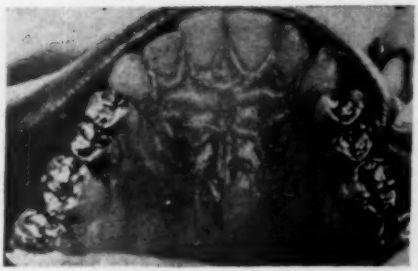

Fig. 10.—Cavity outlines for the M.O.D. inlays were extended to include the cusps. Capping the cusps tends to strengthen the teeth by tying structural elements of crowns more tightly together. Also these extensions allow margins of restorations to be carried to a position where stresses cannot bear directly into them. The outline form of distal occlusal restoration in maxillary left first buscuspid follows orthodox design, since mesial marginal ridge remains intact, thus lending ample support to buccal and lingual cusps of the tooth. (Courtesy of Dr. Harry R. Potter, Los Angeles.)

Jones[3] has pointed out that:

Failure to recognize the possibilities and advantages of gold foil has resulted in an aversion to its use by a large portion of the profession. This antipathy of the dentist, when cloaked in the garb of esthetics, has readily influenced the public against the use of foil.

Silicate is far more widely used as a filling material than gold foil. This is due not to the superiority of silicate as a restorative medium but rather because it offers, in most instances, a simpler, easier, and temporarily more esthetic result. It is doubtful that the ultimate loss of tooth structure, brought about by the constant replacement of failing silicates, can be justified by this temporary esthetic satisfaction. While we must exercise judgment and be selective in the use of gold foil, it still stands unexcelled as a restor-

3. Jones, E. M.: The Treatment of Initial Caries in the Anterior Teeth with Gold Foil. *J.A.D.A.* 26:532 (April) 1939.

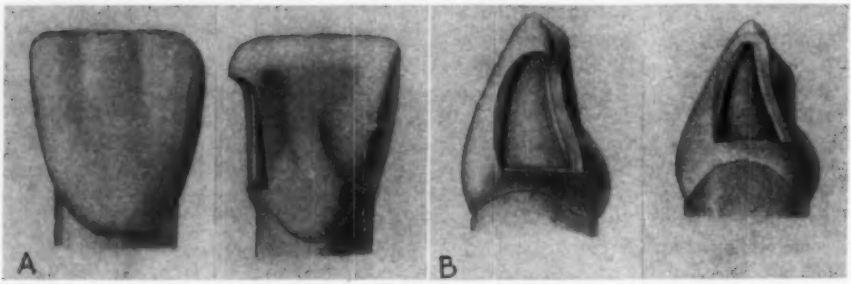

Fig. 11.—A: Placement of labial outline of a Class III gold foil restoration parallel with long axis of tooth produces the most esthetic result. Ample convenience can be obtained by greater extension of lingual wall through which bulk of condensation may be accomplished. B: Retention for Class III foil preparation is established in the form of three-point triangle. Gingival convenience points, placed just within the dentin and connected by accentuated gingivo-axial line angle, form base of triangle. The third point of anchorage is established by slight boxing of incisal point angle. This incisal box form must allow for sufficient bulk of gold to resist forces directed against lingual surface of restoration during mastication

ative material when used where indicated.

If confidence in the manipulation and use of gold foil is to be developed and maintained, every effort must be made to simplify and standardize gold foil technics. The use of foil by the average operator must become a practical, profitable and pleasurable part of his daily work.

Although the importance of the mechanics of manipulation must not be underemphasized, discussion here must be limited to the characteristics of cavity preparation pertinent to esthetics, ease of manipulation, and finish of the foil.

Class III Cavity.—The utmost skill and artistry are required in the development of the preparation of Class III cavities for gold foil restorations in order to obtain permanency and esthetic satisfaction. Esthetics is the least understood feature of the Class III foil preparation. The poor esthetic quality of gold affords the most common argument against its use. However, a foil restoration with properly established outline form can usually be finished to blend with tooth contour so harmoniously that the finished restoration will be relatively inconspicuous. A porcelain inlay or silicate filling which is out of harmony with the contours of the tooth is conspicuous regardless of the harmony of color. In the Class III foil cavity (Figs. 11 and 12) the most harmonious and esthetic result can be achieved by establishing the labial outline to blend with the long axis of the tooth.

Convenience form must be considered in direct relation to the esthetics of the restoration (Fig. 11A). The requirement

Fig. 12.—Proper application of rubber dam and proper placement of no. 212 cervical clamp (securely blocked with compound) holds gingival tissue in retracted position and affords excellent field of operation for ample extension of cavity outline form

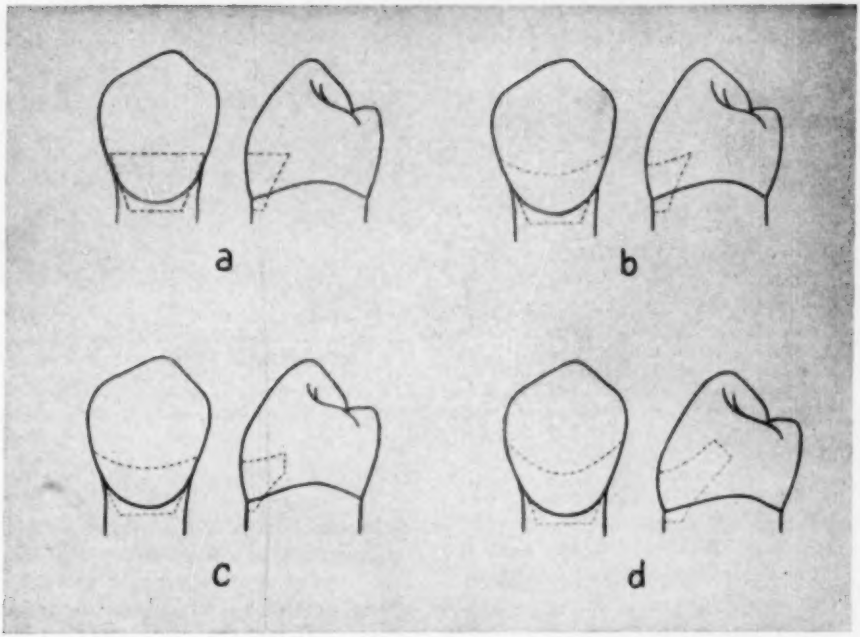

Fig. 13.—Variations in outline form for Class V foil. A: A straight incisal or occlusal margin is indicated where there has been considerable destruction of enamel tooth surface in the cervical area. B: A curved incisal or occlusal margin produces a more harmonious outline form and allows for greater conservation of labial and buccal tooth surfaces. C: Where gingival erosions extend into interproximal embrasures, cavity outline must be extended to include these areas. D: Where lines of decalcification follow crest of gingiva, box forms must be extended in direction of contact points to include them

of labial extension for esthetics, in most cases, provides ample convenience form which is so necessary to access for condensation of the foil, as well as extension for immunity. Sufficient convenience form can be established, without involving the consideration of esthetics, by a greater extension of the lingual wall through which the bulk of the condensation of the foil is accomplished.

Great care is required in the placement of the retentive features of this cavity (Fig. 11B). Retention is established in the form of a three-point triangle. The gingival convenience points, placed just within the dentin and connected by an accentuated line angle, form the base of the triangle. These details afford the principal anchorage for the foil. The third point of anchorage must be established between the two rather fragile plates of the enamel approaching the incisal portion of the tooth. The anatomic form of the tooth and the cavity design in this area afford much less dentin support for the lingual plate of enamel than for the labial. Therefore, it is logical that the incisal retentive feature must be established at the expense of the labial wall, pulpo-axial wall, and incisal angle of the tooth, but never at the expense of the weaker lingual wall. Sufficient boxing out of the incisal point angle must be accomplished for the reception of an ample bulk of foil if the restoration is to resist the forces normally directed against

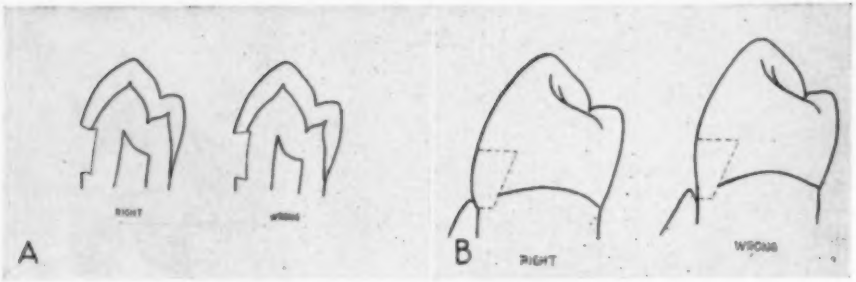

Fig. 14.—A: The principal retention in a Class V foil preparation is obtained by slightly accentuating gingivo-axial and occluso-axial line angles placed just within the dentin. Complete undercutting of surrounding walls of Class V cavity would dangerously weaken enamel and cementum margins of preparation and result in reflection of gold through enamel surface of tooth just above incisal or occlusal margin of restoration. B: Normal gingival contours must be restored in placement of cervical restorations if health of investing tissue is to be promoted and maintained

its lingual surface. Inadequate incisal retention unquestionably leads to more failures of the Class III foil than does any other single feature of cavity preparation. To reiterate, harmonious labial outline form, as well as symmetry of contour, are the chief determining factors for the esthetic possibilities of the Class III foil restoration.

Class V Cavity.—The Class V cavity represents the most classic indication for the placement of gold foil and demands the least effort to gain the most gratifying results. The simplicity of the cavity design should appeal to the average practitioner. It is possible more nearly to approach perfection of margins with foil than with any other restorative material.

As in all other foil operations, the Class V cavity design requires that the operator employ routine standardized steps in the development of the preparation. A proper application of the rubber dam with careful adjustment of the cervical clamp (Fig. 12) affords an excellent field of operation with adequate room for placement of the gingival wall and careful finish of this margin, which usually lies in cementum. Variations in outline form for this cavity appear in Figure 13.

The position of the interseptal dam, holding the tissue in a retracted position, affords an excellent guide for determining extensions of the mesial and distal walls to prevent recurrence of decay and assure permanency. The incisal or occlusal wall is established in enamel and should be carried to the height of the cervical convexity of the crown. The presence of erosion, decalcification and abnormal contours of the enamel in this

Fig. 15.—Mouth containing 24 Class V gold foil restorations. Cervical tooth structure had been destroyed by erosion and caries. Restoration of proper gingival contours, adequate extension of cavity outlines, and perfection of margins are factors responsible for healthy gingival tissues. This photo was taken five years after placement of gold foil restorations. (Courtesy of Dr. Harry R. Potter, Los Angeles.)

area will require that additional extension be made to include them.

Retention (Fig. 14A) is obtained by a slight undercut of the occlusal and gingival walls, placed just within the dentin. The proximal walls diverge from the cavity in such a manner as to maintain strength and resistance against the line of force of condensation. These proximal walls are not undercut and therefore afford little in the way of retention. It is an underlying principle that the material depends not only upon undercuts for retention but also upon the elasticity of dentin. The walls of the cavity must be prepared so that the foil can be tightly wedged between them. The dentin will then be compressed. This will result in a positive pressure against the gold to seal the cavity margins adequately and aid in retention.

Tooth contour, which is so important to the promotion and maintenance of tissue health, can be beautifully reproduced with the Class V foil restoration. The chief determining factor from the standpoint of esthetics is the placement of the incisal or occlusal margin of the cavity. The outline of this wall can be developed to harmonize with tooth form remarkably well. See Figures 14B and 15.

With a keener understanding of the fundamentals of cavity preparation and an appreciation of the many virtues of gold foil, there should be more universal use of this material. The advent of the pneumatic condenser and the more recent introduction of the highly efficient electromatic one have greatly facilitated foil manipulation for the operator. The oft-repeated plaint that the patient will not tolerate the use of the dam and the placement of gold foil becomes a fallacy to the progressive dentist. Once educated to an appreciation of the qualities of the gold foil restoration, there are few patients who will not consent to this operation. See Figure 15.

Summary

The preparation of teeth to receive restorations is being woefully neglected at the present time. The importance of the fundamental principles of cavity preparation in relation to the successful restoration of lost tooth structure should be recognized and these principles should be applied to all phases of operative dentistry. A better understanding and appreciation of the biologic concepts of cavity preparation are a prerequisite to future progress in the field of restorative dentistry.—*6253 Hollywood Boulevard.*

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Legislation Is Not Enough.—J. G. Hunter, general secretary, Federal Council, British Medical Association in Australia, told the Canadian Medical Association recently that, although a National Health Insurance Bill had been adopted by the last Parliament, the doctors had not yet agreed to accept its provisions. One provision was that a doctor who wrote a prescription without seeing the patient would be subject to three months in jail. Members of the medical profession in Australia have voluntarily subscribed $75 each for fighting the government regulations.—*From an editorial in Vol. 10, No. 7, July 1949, North Carolina Medical Journal, p. 381.*

TREATMENT CONSIDERATIONS FOR THE LOSS OF CHILDREN'S PERMANENT INCISOR TEETH

Joseph T. Hartsook, D.D.S., M.S., Ann Arbor, Mich.

A TREATMENT plan for the restoration of a child's lost or missing permanent incisor tooth always must be guided by a consideration of more factors than mere esthetic requirements. For the growing child the satisfaction of esthetic requirements often becomes complex, but the protection of the health of traumatized young teeth and the preservation of the remaining dental structures to permit individual growth and function are still more important requirements. It is the purpose of this paper, therefore, to point out and discuss a number of the factors which should influence the examination, the diagnosis that follows and the treatment when a young patient has lost a permanent incisor tooth.

During the mixed and early adult dentition periods, from 7 to 15 years of age, hereditary and environmental factors are operating effectively to produce developmental changes in the dental structures which terminate in the mature adult dental apparatus. Any appliance which is employed to restore missing permanent anterior teeth must be planned and constructed to permit individual growth and development of the teeth, arches and associated oral structures and the proper evolution of function.

Questions arise immediately when planning prosthetic treatment for the child patient who has lost a permanent incisor tooth. They are: (1) Is the prosthetic restoration indicated for reasons other than esthetics? (2) How much of a factor is the patient's age in the planning of a restorative appliance? (3) What is the ideally constructed appliance for this growing child patient?

Conclusions based upon studies of (1) hereditary and environmental factors as expressed in the growth and development of the dentofacial complex,[1-11] (2) operative plans of treatment and technics which consider the morphologic and physiologic characteristics of the tissues

Presented before the Section on Operative Dentistry at the ninetieth annual session of the American Dental Association, San Francisco, October 19, 1949.

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which are to receive the treatment,[12-22] (3) phonetics and speech habilitation[23-26] and (4) esthetics,[27,28] all taken together, serve as dependable guides to direct better the prosthetic treatment plan.

It is well to remember that the period of time with which this discussion is concerned contains both a plateau period and an accelerated period in the child patient's general body growth. Scammon[29] has reported a rapid rise in the general body growth of a child until the age of 3 to 4 years followed by a period of slower growth until 13 to 14 years of age at which time the gonadal influence stimulates rapid postpubescent growth that terminates in maturity by 18 to 19 years of age.

Krogman[30] also has indicated, in addition to general body growth, that there is a periodicity in dentofacial growth which occurs in three planes: height, width and depth. Increases in the dimensions of the face follow a pattern of acceleration and deceleration. For height, periods of acceleration occur at birth to 1 year, 3 to 4 years, 7 to 11 years and at 16 to 19 years. Face length increases rapidly from birth to 1 year, 4 to 7 years and from 16 to 19 years of age. Growth of the face in width is slow until 6 years but periods of rapid growth occur from 6 to 12 years and from 16 to 19 years of age. Further, Hellman[31] has reported that there are two phases of growth and development of the face: (1) growth or an increase of the facial tissues; (2) a development that results in the differentiation of the face owing to changes in proportion and distribution of the facial tissues.

Simultaneous with the processes of general body and facial development there occurs in the child the initiation, development and eruption of the teeth. Calcification of the permanent dentition is a postnatal process.[32] The crowns of the permanent central and lateral incisor teeth complete their calcification between the fourth and fifth years of life. Eruption of the eight incisor teeth is begun with the mandibular central incisors at the average age of 6 to 7 years and is completed with the maxillary lateral incisors between 8 and 9 years of age. The roots of the maxillary and mandibular incisors complete their maturation between 9 and 12 years of age; the roots of the maxillary lateral incisors are the last to complete calcification. The variety of growth phases experienced in the mouth parts of a growing child preclude hurried

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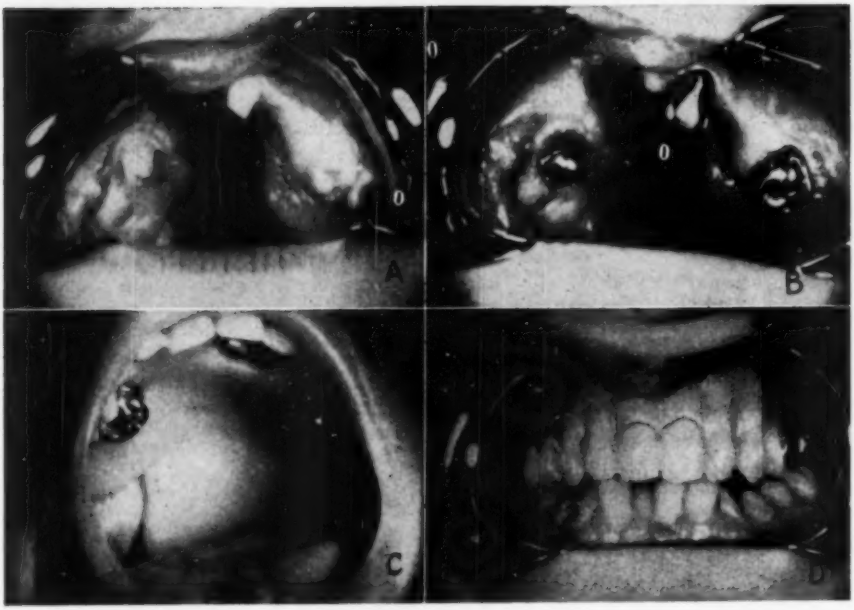

Fig. 1.—A: Unoperated cleft palate with multiple absence of teeth. Two molars, one bicuspid and one lateral incisor comprised the entire complement of teeth. B: Four maxillary teeth were crowned for clasp retention of a partial denture appliance. C and D: Completed prosthetic appliance in place. An obturator was supplied to aid speech

judgments during prosthetic treatment planning.

Restoration for Reasons Other Than Esthetics

It may be said that the need easily is distinguished from a want since the need emphasizes the necessity for replacement of a lost tooth.

Moore,[4] from a study of the operation of heredity in the production of the features in the human dentofacial complex, has concluded that acquired mutilations of dentitions account for a recognizable proportion of orthodontic treatment cases. Drifting of permanent teeth following the loss of an incisor is one factor which indicates the need for replacement of the lost tooth. Friel[33] has reported that evidence of growth and development of occlusion indicates that many teeth move forward into spaces created in the dental arches following extractions.

Prevention of space closure in the anterior portions of young dentitions by the construction of some prosthetic appliance not only may be indicated for esthetic reasons, but as a preventive of malocclusion. Good dental practice seems to imply that the need should be satisfied promptly after the loss of a permanent incisor tooth in a growing and developing dentition. It is quite probable, if the prosthetic replacement of all lost incisors were based upon the routine dictum, all spaces created by mutilation will close, that the spaces in some mouths without treatment would not close and thus would

33. Friel, Sheldon, Migrations of Teeth Following Extractions. *Proc. Roy. Soc. Med. (Odont. Sect.)* 38: 456 (June) 1945.

repudiate such a directive. Longitudinal growth studies, at any rate, lead to the conclusion that occlusion should not be considered as a single attribute but rather as a result of the combination of many genetic and environmental attributes. Because of the hazards of predicting the direction and rate of development of young dentitions,[2] and because space maintenance is simpler treatment than space opening, the placement of a replacement tooth soon after the loss of a young permanent incisor can be judged conservative, preventive orthodontic treatment.

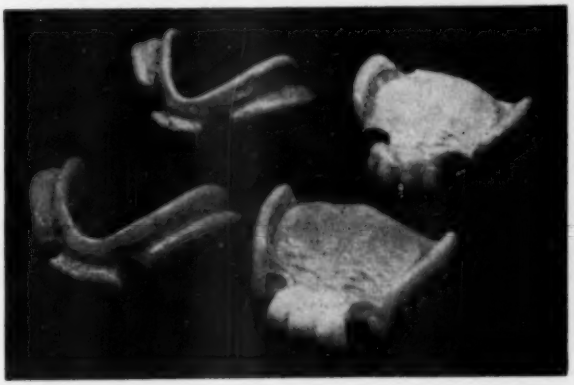

Fig. 2.—Two sets of partial dentures. Upper: With clasps, inserted at 6 years, 6 months. Lower: Without clasps, inserted at 9 years, 8 months

Esthetics, a factor which stimulates further the decision to replace a lost anterior tooth immediately, often tremendously affects the child patient's developing personality. Appearance, a prominent factor in the personality of a young person, is affected unfavorably by missing permanent incisor teeth and some children, particularly those who are maladjusted, may have difficulty adjusting their speech habits to missing incisors.

Treatment for the developmental defects found in the patient with oral clefts, one out of 560 live births in Michigan for the years 1942 through 1945, often requires the services of the oral surgeon, the operative dentist, orthodontist, prosthodontist and the speech correctionist. The psychology of each member of the team is important for the healthy emotional development of the patient as the treatment proceeds toward the goal of rehabilitation.

Various technics for the cleft palate appear to have relative merit.[34,35] Surgical treatment fails, however, partially or completely, in the treatment of some cleft palate patients,[36] possibly because of technic or of difficulties with scar tissue or of the developmental potentialities of the young patient. The need for teamwork in the treatment of cleft palate cases is emphasized further by the evidence[9] that underdevelopment of the maxilla with a complete cleft and extreme irregularity of the teeth may be associated with or without surgical procedure. At any rate, for the scientific and humanitarian treatment of cleft palate

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patients, dental teamwork with correlated responsibilities is demanded.[37-42]

Figure 1A illustrates an unoperated cleft palate occurring in a young woman. At the time of her initial examination this patient had four maxillary teeth, two molars, one bicuspid and one lateral incisor. The dental treatment planned for this patient consisted of crowning the four maxillary teeth (Fig. 1B) for protection and for clasp retention of a partial denture appliance which supplied the patient with an obturator to improve her speech, as well as the teeth that she needed for mastication and appearance. The anterior teeth were placed labial to the patient's lingually-posed single lateral incisor which was retained to assist in the retention of the appliance (Fig. 1C and D). A speech training period began after the insertion of the appliance.

An anomaly of growth which affects numbers of teeth is the developmental syndrome known as ectodermal dysplasia,[43,44,45] a syndrome characterized by a general suppression of ectodermal tissue which produces atypical skin, hair, nails, iris and teeth. At the time of the first examination, this 6 year old boy had two maxillary and two mandibular cuspid-like, conical teeth, a flat anemic palate with flabby pads of tissue over the tuberosities, and a spiny, thin mandible with soft, mobile pads of tissue over the retromolar areas. The treatment plan that evolved included the crowning of the four conical teeth to secure retention and the construction of maxillary and mandibular partial dentures. To restore function and, equally important, to relieve the patient's chief complaint which was the teasing by classmates in school due to his odd dental and facial development, partial dentures were inserted at six and one-half years of age. Three years later the crowns on the four cuspid-like teeth were remade and new claspless partial dentures were constructed.

Figure 2 illustrates the gross change in size of the two sets of dentures. All measurements indicate that growth continued to occur regardless of the confinement potentially possible as the result of continued wearing of the maxillary and mandibular partial dentures.

Possibly a more frequent problem in prosthetic dentistry for the treatment of lost anterior teeth in young patients involves the replacement of one or two incisor teeth. The prominent central incisors in either arch may be lost by accident and the maxillary lateral incisors may be genetically missing from the dentition.

The Age Factor

The significance of age as a factor in planning prosthetic dental treatment for the young patient is related to the degree of total dental maturity of the child rather than the degree of individual tooth maturity or the chronologic age of the child at the time treatment is planned. An opinion that an 11 year old child is not a candidate for a fixed bridge as a prosthetic replacement for a lost incisor tooth represents a platitude. That some

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38. Dodds, Paul, The Responsibility of Public Health Agencies to Cleft Palate Patients. *Am. J. Orthodont. & Oral Surg. (Oral Surg. Sect.)* 32:665 (Nov.) 1946.

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45. Brodie, A. G., and Sarnat, B. G., Ectodermal Dysplasia With Complete Anodontia. *Am. J. Dis. Child.* 64:1046 (Dec.) 1942.

dentitions are too immature at this age for fixed anterior bridge prostheses is quite probable, but not because of the mere immaturity of the individual teeth which serve as bridge abutments. To decide against the employment of a fixed bridge for the young patient because abutment preparations are contraindicated by the large pulps does not recognize fully the typical morphologic aspects of the pulp chambers of young permanent incisors. It has been demonstrated that these teeth can be utilized advantageously for bridge abutments. A more pertinent contraindication for a fixed bridge in the mouth of a young patient arises from the immaturity of the dentition, particularly those aspects of the dentition that relate to the relationship of the abutment teeth to each other, to the adjacent and opposing teeth and to the dental arches at the time of the examination.

The Ideal Replacement

A thorough understanding of the factors involved and the establishment of a set of principles which can serve to direct the treatment planning are required in constructing the ideal replacement. A study of the problem and an examination of the literature indicates that any treatment for the loss of a permanent central incisor tooth in a young dentition should: (1) protect the health of the surrounding teeth and associated soft tissues; (2) preserve the occlusion by maintaining space within the dentition in harmony with the

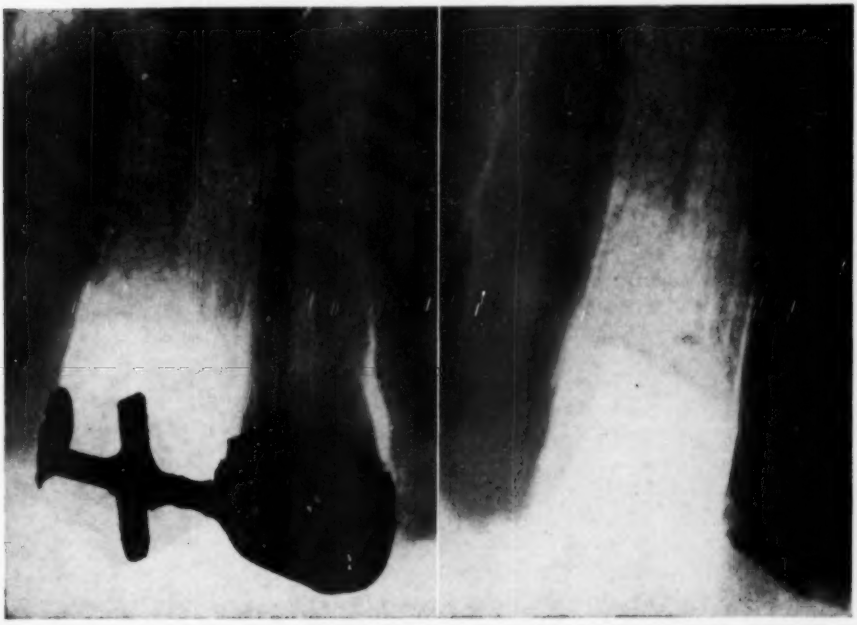


Fig. 3.—Left: Fixed bridge pontic used to replace maxillary left central incisor and to close diastema in this young developing dentition. Pontic was too wide to permit normal developmental closure of midmaxillary spacing and too wide to be an esthetically satisfactory replacement. Right: Fixed bridge removed to permit orthodontic closure of left central space and to provide a more mature alignment of incisor teeth before replacing with fixed bridge

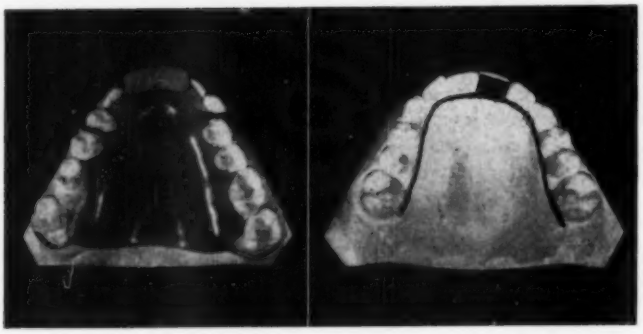


Fig. 4.—Left: Removable full palate acrylic partial denture used as a temporary appliance to replace two maxillary central incisors in a developing dentition. Right: Orthodontic appliance with pontic attached to lingual arch wire used as a temporary replacement for a lost permanent central incisor in a young dentition

patient's immediate level of dentofacial development and by permitting growth and development to proceed after prosthetic treatment (Fig. 3); (3) permit speech to develop without impediment from the loss of the tooth or the presence of the prosthetic replacement; (4) prevent the development of emotional disturbances because of an unesthetic replacement.

Time, an important element in planning treatment for the growing child,[46-50] operates to the advantage of the dentist when growth and developmental forces are acting to change the dentition. The expedient use of temporary appliances satisfies the need for replacement of a lost permanent incisor and permits postponement of final treatment while the dentition develops to sufficient maturity to permit the use of a fixed bridge as a replacement. The use of temporary appliances in developing dentitions may be necessary, for example, when the teeth which must be utilized as bridge abutments have not reached their adult positions in the dental arches.

Broadbent[51] has concluded that during the eruption of the permanent central incisors, particularly the maxillary teeth, spacing may be present between these teeth which, in many cases, persists for three or four years and in some patients does not close until the maxillary cuspids erupt.

Hellman[52] has reported that the eruption of permanent teeth is not a continuous process. Rather, it is divided by a period of rest into two active periods. The first active period involves the eruption of the first molar and incisor teeth, whereas the second active period follows with the eruption of the cuspids, bicuspids and the second molar teeth.

46. Hellman, Milo, The Optimum Time for Orthodontic Treatment. *J.A.D.A.* 29:622 (April) 1942.

47. Higley, L. B., The Proper Time to Begin Orthodontic Treatment. *J.A.D.A.* 30:1329 (Sept.) 1943.

48. Smith, D. J., When to Start Orthodontic Treatment Considering Age and Relative Growth. *Am. J. Orthodont. & Oral Surg.* 33:36 (Jan.) 1947.

49. Waugh, L. M., Discussion on Symposium on Early Treatment. *Internat. J. Orthodont. & Oral Surg.*, 23:332 (April) 1937.

50. White, W. W., Age Factor in Treatment Planning. *Am. J. Orthodont.* 34:841 (Oct.) 1948.

51. Gregory, W. K., Broadbent, B. H., and Hellman, Milo, *Development of Occlusion* (Broadbent, B. H., Ontogenetic Development of Occlusion, pp. 31-48). Philadelphia: University of Pennsylvania Press, 1941.

52. Hellman, Milo, The Phase of Development Concerned With Erupting the Permanent Teeth. *Am. J. Orthodont. & Oral Surg.* 29:507 (Sept.) 1943.

Cohen[53] has concluded from a longitudinal study of 11 years' duration that the acceleration of growth between the maxillary cuspids (concerns arch width as measured by interdental spaces, not facial widths as expressed by bizygomatic measurements) is greatest from 5 to 8 years of age. Slower steady growth continues until approximately 12 years of age. The distance between the mandibular cuspids approaches a maximum at 8½ years and from that point little growth occurs in this part of the mouth. Evidence from this study of repeated measurements of the same children indicates that the greatest lateral growth in the dental arches occurs in the cuspid region and the most accelerated growth occurs during the eruption of the permanent incisors.

Broadbent,[51] discussing the "ugly duckling" stage of dentofacial development, has reported that this stage of development reaches its maximum at about 10 years of age. The Bolton study records indicate that the apical ends of all lateral incisors remain converged toward the midline of the arches until the maxilla and mandible increase in size sufficiently to permit these teeth to take a more upright position. With further development of the face comes increased growth in the subnasal area and the maxillary cuspids move down, forward and laterally away from the root ends of the laterals. This study indicates, until the cuspid teeth approach their mature places in the dental arch, that there is insufficient space at the apical base to permit the roots of the lateral incisors to shift into the more vertically normal alignment of young adulthood; that is, away from the midline of the arch. Broadbent concludes, "it is obvious that to correct the 'ugly duckling' incisor alignment between eight and twelve years of age is fraught with hazards that are greater in the underdeveloped face than one that is normal for its age." Further, this investigator has reported that the Bolton clinical records, in all but a few cases, have justified the clinician's reluctance to encumber natural developmental forces with mechanical interference during this period of incisor development.

Similarly, evidence obtained at the University of Michigan[2] confirms the conclusion that one cannot but view with suspicion any attitude that the dentition and supporting structures are self readjusting to all kinds of variations which are imposed by nonhereditary forces. The use of a temporary appliance (Fig. 4),

53. Cohen, J. T., Growth and Development of the Dental Arches in Children. *J.A.D.A.* 27:1250 (Aug.) 1940.

Fig. 5.—Left: Space created by loss of permanent maxillary left central incisor. Right: Roentgenographic evidence of root maturity, root positions and size of pulp chambers of abutment teeth in mesiodistal diameter

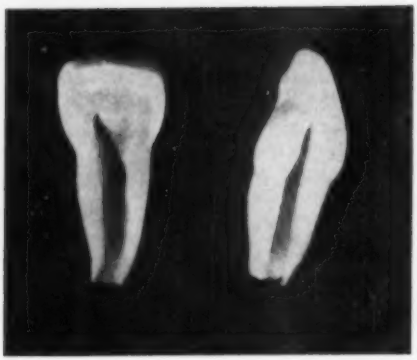


Fig. 6.—Sectioned pulp chambers of two permanent maxillary central incisors from a child 7 years old. Note the broad flare of the coronal pulp chamber in the mesiodistal view as compared with the smaller tapered configuration in the labiolingual aspect

one which will supply the missing permanent incisor without rigid attachment to adjacent incisor teeth, appears to be the best choice of replacement during the transition period of development while further growth is taking place. Temporary appliances can be constructed to prevent space closure and to restore the esthetics of the mouth without interfering with the growth and development of the young dentition. A temporary appliance may become a liability in the mouth and its acceptability depends upon the accuracy of fit achieved with the appliance and the adaptability of the patient to the appliance.

In constructing the ideal appliance to replace a maxillary permanent central incisor tooth for a young child patient, individual problems must be considered. Figure 5, left, shows the space created in the mouth of an 11½ year old patient following the loss of a maxillary left permanent central incisor. Figure 5, right, illustrates the abutment teeth which were to be employed for a permanent fixed bridge as the choice of a replacement in this well-developed, nearly mature mouth. An examination of the roentgenographic evidence indicated that root development of the abutment teeth, the maxillary right central and left lateral incisors, was complete. The roentgenographic evidence further supplied objective evidence of the mature vertical root positions of the abutment teeth, and of the relatively broad coronal pulp chambers in their mesiodistal diameters, especially in the right central incisor.

Two sectioned permanent maxillary central incisor teeth from the mouth of a 7 year old child are shown in Figure 6. The bulk of the large pulp chamber in a young permanent central incisor tooth, essentially is one of breadth in a mesiodistal diameter when compared to the much smaller coronal pulp chamber in a labiolingual coronal section. The relatively small labiolingual diameter of the pulp in the permanent maxillary central incisor makes available a tooth with a relatively thick area of dentin lingual to the coronal pulp into which a pinhole can be prepared at the cingulum. Equally important, the thickness of dentin lingual to the coronal pulp tissue continues rootwise sufficiently that the pulp tissue need not be injured by the preparation for the pinhole, or by the subsequent cast restoration.

Figure 7A illustrates the abutment gold castings which were employed in this mouth. The right central incisor was prepared to receive a modified three-quarter crown with a cast lingual pin for added retention. The tooth preparation consisted of conservative proximal slices which were confined to the lingual three-

quarters of the proximal surfaces of the crown and prepared just through the labial proximal embrasures to eliminate any labial display of gold. Shallow proximal grooves into dentin and a 2½ to 3 mm. pinhole, in a plane parallel with the long axis of the root, rather than the long axis of the crown, and well out in the lingual portion of the cingulum, were employed to increase the retention of the abutment casting. A lingual gingival finishing line, connecting the proximal slices, was prepared just under the free gingival epithelium. Enough lingual enamel was removed to free the occlusion with the opposing incisors and a groove was placed across the lingual enamel 2½ mm. short of the incisal surface to provide a lingual-incisal finishing surface and to complete this abutment preparation. The lingual incisal finishing line was established short of the incisal edge of this tooth to prevent discoloration of the translucent incisal portion of the crown of this young tooth.

The preparation for the lateral incisor consisted of a mesiolingual cavity which was sufficiently wide on the lingual surface in a mesiodistal direction to permit a groove in the casting into which a bar (Fig. 7B), extending from the pontic, could rest and thus provide the bridge support without rigid attachment of the lateral incisor to the other abutment tooth through the bridge. The pontic tooth was soldered to the modified three-quarter crown on the right central incisor. Figure 7C illustrates the labial view of the completed bridge and shows the lost left central incisor replaced for this 11½ year old patient. No gold is displayed from the labial surfaces of any of the involved teeth.

Already there is evidence to conclude that the case of a fixed bridge to replace the lost permanent maxillary central incisor of this 11½ year old patient is clinically acceptable. However, it would be desirable to have more evidence of the scientific acceptability of such treatment secured from the observation of a sufficiently large number of children over a period of time long enough to provide ample justification for the use of fixed

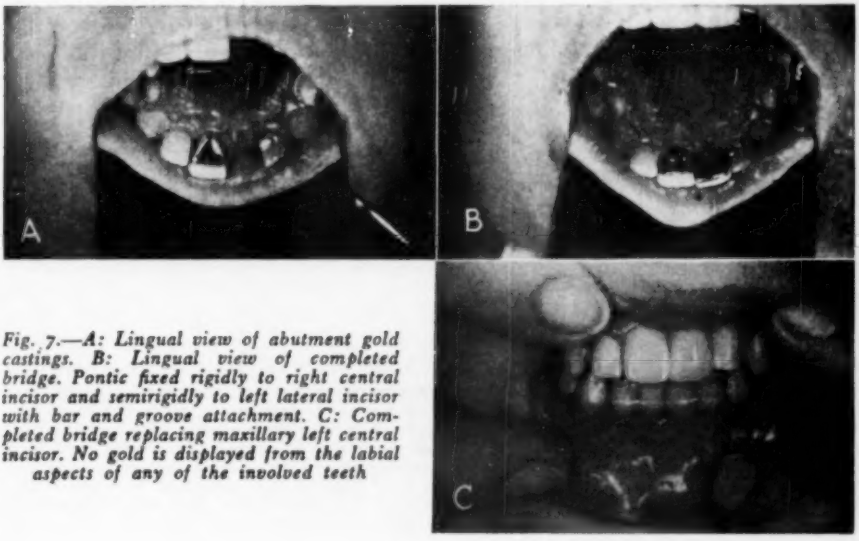


Fig. 7.—A: Lingual view of abutment gold castings. B: Lingual view of completed bridge. Pontic fixed rigidly to right central incisor and semirigidly to left lateral incisor with bar and groove attachment. C: Completed bridge replacing maxillary left central incisor. No gold is displayed from the labial aspects of any of the involved teeth

prosthetic restorations for the replacement of lost permanent incisor teeth in young dentitions.

Summary

This discussion of prosthetic dental treatment for child patients who experience the loss of permanent incisor teeth has presented some impressions of the past, an evaluation of certain recommended technics and a prospectus of the future of prosthetic dentistry for young patients. It has been pointed out that during the mixed and early adult dentition periods, when hereditary and environmental factors are operating to produce changes in the dental structures which terminate in an adult dental apparatus, any treatment for the prosthetic replacement of a lost permanent incisor tooth should (1) protect the health of the remaining teeth and the associated soft tissues; (2) preserve the occlusion by maintaining space within the dentition in harmony with the patient's immediate level of dentofacial development and permitting individual growth and development to proceed after prosthetic replacement; (3) permit the proper evolution of function and speech to proceed without impediment from the loss of the tooth or the prosthetic replacement; (4) prevent the development of emotional disturbance because of unesthetic replacement.

Further, it has been pointed out that the significance of age as a factor in planning prosthetic treatment for young patients relates to the degree of maturation of the dentition rather than the degree of individual tooth maturity or chronologic age of the child at the time treatment is planned.

During the transition period of development, while one waits for further development of the dentition, a temporary appliance may be constructed to prevent space closure and to restore the esthetics of the mouth without interference with the growth and development of the young, changing dentition.

The restoration of choice, a fixed bridge replacement, can be employed with young patients. However, the final acceptability of such treatment awaits further scientific justification.

▲

Dissemination of Knowledge Among Scientists.—Conservatively it has been estimated that at least 750,000 reports (scientific papers) are published annually—and some authorities place the number as high as 2,000,000 annually. Some of these research reports appear as technical books, dissertations, and bulletins, but mostly they appear as articles in scientific periodicals, and such periodicals number possibly 50,000. No library possesses all of them, hence, inter-library borrowing and the distribution of photographic copies of documents are important features in the dissemination of information among scientists.—*John E. Flynn, "The Role of Scientific Abstracting Journals," UNESCO Courier 2:9, July 1949.*

ASPECTS OF ORAL DIAGNOSIS AND ORAL SURGERY OF INTEREST TO THE GENERAL PRACTITIONER

Merritte M. Maxwell, D.D.S., Pearl Harbor, T. H.

In the light of present knowledge regarding oral diagnosis and surgery, this paper is prepared with the objective of presenting a series of guiding principles, comprising a mental pattern, which will be useful in daily routine practices. Theorization and development of supportive scientific data are restricted in order to permit broader coverage of the subject matter, exposition being mostly devoted to essential points of a practicable, applicable nature.

It is assumed that most surgical problems in dentistry fall within the realm of oral diagnosis and minor surgery; consequently, the practitioner is vitally interested in accomplishing these phases of practice in accordance with modern technic and with minimal risk to his patient and himself. If this is a correct premise, adherence to certain fundamental principles will pay the practitioner handsome dividends of increased personal satisfaction in his daily work—satisfaction derived from the knowledge that he has served the best interests of his patients by rendering a high type of service.

Lyons[1] has defined diagnosis aptly as "the conclusion arrived at in the process of applying the mind to a collection of scientific data." With this definition as a guide, let us consider the minimal diagnostic requirements prior to surgery, regardless of the type of operation. These requirements will be considered briefly under four headings, which collectively might be termed a "basic diagnostic square" (Illustration). It will be helpful to interpret the four components of this diagnostic square in terms of a collection of diagnostic means, each component meriting consideration in the establishment of the ultimate diagnosis, which is nothing more than a summation and critical evaluation of all the diagnostic requirements entering into the formation of the geometric figure.

Oral Diagnosis

General.—First, we shall direct our attention to general means which constitute the foundation of the diagnostic square. These considerations include the patient's history and physical examination. It is obvious that detailed data in these two categories frequently exceed the limitations of a busy general dental practice. Nevertheless, serving the best interests of the patient as well as protection for the dentist demands that certain minimal, pertinent, preliminary data be obtained relevant to the patient as a complete entity. The answers to a few well-chosen questions will ordinarily suffice for history-taking and will elicit sufficient information of a subjective nature to determine the necessity for a more detailed investigation. These questions are: (1) Are you at present under treatment by a physician? (Present medical history.) (2) If illness exists, what is your chief difficulty?

Commanding Officer, U. S. Naval Dental Clinic, Pearl Harbor, T. H.

The opinions or assertions contained in this article are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

1. Lyons, C. P., Diagnosis of Oral Conditions. *J.A.D.A.* 19:415 (March) 1932.

(Chief complaint.) (3) Have you had any previous operations, injuries, or diseases? If so, was your recovery uneventful or did you have any complications? (Past medical history.) Inquiries of this nature may serve to reveal the presence of a systemic condition requiring special preparation or treatment prior to surgery; or again surgery, other than that of an emergency nature, may be entirely contraindicated. For example, patients with diabetes mellitus have a low resistance to infection with consequent delay in healing. Elective extraction for such patients should be avoided until their carbohydrate metabolism is under control.[2] Similarly, no extractions should be undertaken in the presence of blood dyscrasias such as leukemia, aplastic anemia, hemophilia, and purpura hemorrhagica. These conditions, as well as heart disease, require active collaboration with the patient's physician prior to any surgical intervention.

Questioning the patient, particularly as to previous oral surgical operations, will frequently elicit helpful information as to the possibility of postoperative hemorrhage, the incidence of dry socket, or untoward reaction with certain previously used anesthetic agents. Being thus forewarned, alteration of the treatment plan to meet the patient's particular requirements will insure better surgical results.

The minimal preliminary examination necessitates at least a visual observation of the patient's general physical condition. In the presence of cachexia as manifested by general ill-health or malnutrition, of marked pallor as exemplified in the anemias, of cyanosis and respiratory difficulty as demonstrated in heart disease, and of other obvious signs of physical disability, surgery is wisely postponed until a better evaluation is made of the surgical risk involved.

Local.—The second component of the diagnostic square (2 in illustration) concerns itself with an examination of the oral cavity and adjacent anatomical structures. Frequently, this examination is made in a cursory manner with attention centered only upon the teeth and investing tissues. Such a diagnostic approach fails properly to correlate local and general findings in consideration of the whole patient as a biological entity.

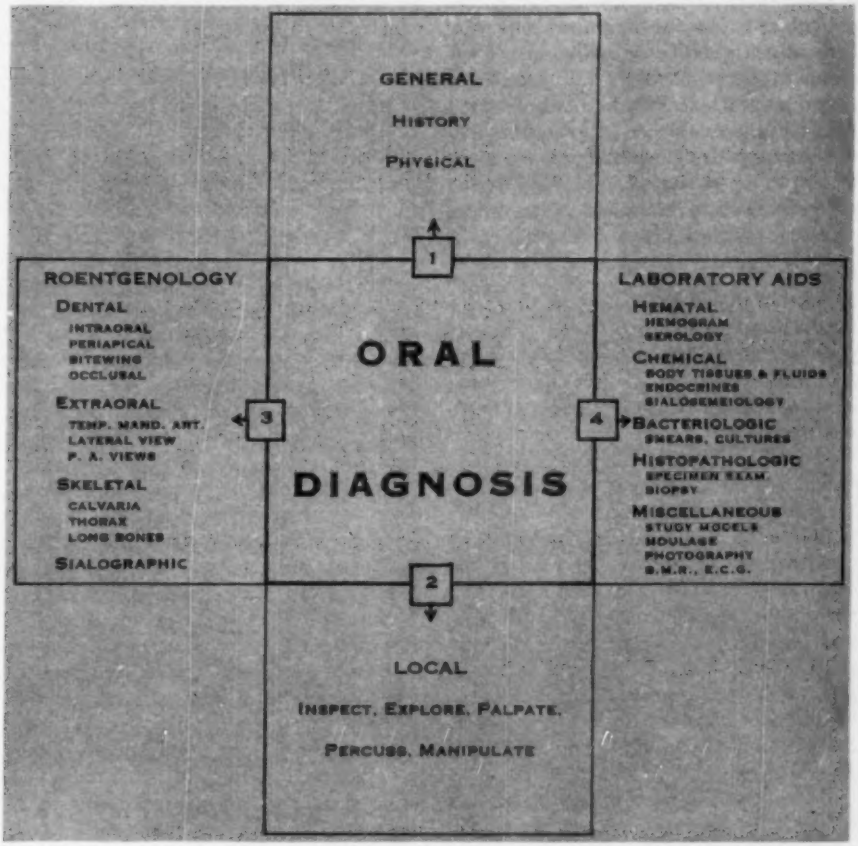
Certainly the oral diagnostician should have a systematic procedure for the investigation of local conditions. Asymmetry of the head and neck as manifested by over or underdevelopment of anatomical parts may be within the limits of normalcy or again may be suggestive of neoplastic disease, endocrine dysfunction, or metabolic abnormality. Attention in sequence should be directed to inspection of the lips, labial and buccal mucosae, palate, oral pharynx, both surfaces of the tongue, floor of the mouth, salivary glands and ducts, the teeth and their investing tissues. Visual inspection of these parts should be supplemented by the free use of other recognized clinical diagnostic procedures such as percussion, manipulation, exploration, palpation and pulp-testing. It is well to remember that while oral conditions such as ulcerations, indurations, and inflamed areas may be entirely local in origin, they may be indicative of grave systemic disorders. For instance, gingival ulcerations may be a clinical sign of an oral Vincent's infection or a manifestation of a fatal leukemia.

An interesting speculation is the number of lives which might have been saved if the health professions had been more meticulous in making thorough clinical examinations of the oral cavity. Dentistry is in a most strategic situation for the detection of mouth cancer, for it is to the dental profession that a layman most frequently goes when there is something wrong with his mouth. Martin[3] of the

2. Boyko, G. V., Care of the Surgical Patient. *J. Oral Surg.* 4:40 (Jan.) 1946.

3. Martin, H., Mouth Cancer and the Dentist. *J.A.D.A.* 33:845 (July) 1946.

Memorial Hospital, New York, indicates that of 72 patients afflicted with cancer of the mouth and subjected to extractions, the probability of cancer was not recognized in 70 per cent of the cases. He further states that it is the dentist on whom initial responsibility for the detection of a malignant growth in the mouth is often placed and to whom the opportunity of saving lives by aiding in the early diagnosis will frequently present itself. In the periodic examination of dental patients, it is well to be cancer conscious so that the detection of suspicious and undiagnosed lesions may be closely observed and prompt biopsy made. Thoma[4] emphasizes this point by stating:



The diagnostic square and its components

In diagnosis, microscopic examination of excised tissue furnishes a control for the correct interpretation of clinical findings and biopsy

4. Thoma, K. H., Oral Surgery, St. Louis: C. V. Mosby Co., 1948. Vol. I, p. 4; Vol. II, p. 1358.

examination is without peer in dealing with neoplasms.

An additional factor to keep in mind is that a cancerous lesion may be present in the mouth for some time without the presentation of any subjective symptoms or complaint by the patient. Probably one of the most neglected phases of a clinical examination is palpation of regional lymph nodes for the detection of adenopathy which may be the only readily discernible evidence of a hidden cancerous lesion. Indeterminate enlargement of lymph nodes should invariably be the cause for a more complete examination.

Roentgenology.—The two vertical components of the diagnostic square deal with means listed under the captions of Roentgenology and Clinical laboratory (3 and 4 in illustration). It is advisable to think of these two vertical components as binding agents serving to unite solidly and support the general and local findings in forming a complete oral diagnostic picture. A mental impression of this nature is helpful in demonstrating the interdependence of the various segments of the diagnostic square without detracting from the primary significance of accurate physical findings only supplemented by supportive data obtained from the clinical laboratory. The mature diagnostician, by virtue of extensive clinical experience, finds himself decreasingly dependent upon clinical aids.

Roentgenology is an indispensable factor in oral diagnosis. Therefore, its importance gives it the stature of a full vertical quadrant of the basic diagnostic square (3 in illustration). Although it is generally agreed that diagnostic roentgenology, as a single phase of the science, usually constitutes only an aid to diagnosis, nevertheless its significance as an essential diagnostic factor must not be minimized. Light regard for diagnostic roentgenology is frequently attributable to deficiencies in technic and interpretation. As a matter of fact, the diagnostic value of any given roentgenogram is directly proportional to the technical perfection of the exposed film and to the capabilities of the interpreter.

The removal of a tooth without the benefit of roentgenographic diagnosis might prove to be decidedly hazardous business, for it is by this means that the surgeon is intelligently able to plan the contemplated surgery by taking into account the possible roentgenographic evidence of infection, malignant and benign neoplasias, bone involvements due to local or systemic disease and odontogenic anomalies. There is recalled the case of a patient having an unusually low-lying maxillary antral floor, which would have been visualized had a roentgenogram been taken. Forceps technic in removing the upper first molar resulted in the loss of a large part of the antral floor with the establishment of an opening into the antrum. A preliminary roentgenogram in this case would have put the surgeon on guard so that he might have taken special precautions surgically to remove the tooth with the least possible trauma. Doubtless many practitioners have observed cases in which failure to use the x-ray has resulted in the non-detection of residual infection, fractures of alveolar bone, retained roots, incomplete removal of cysts, and possibly osteodystrophies associated with systemic diseases.

Preliminary dental roentgenograms may indicate the necessity for more complete skeletal roentgenography. Deviations of normal trabecular structure, radiolucent and radiopaque areas, with or without other clinical signs, may serve as a clue for more extensive roentgenographic examination of other skeletal structures such as the calvaria, the thorax, and long bones. It must constantly be borne in mind that deviations from the normal pattern as observed in dental roentgenography not only may be indicative of local disturbances, but also may be evidence of grave systemic disorders such as

hyperparathyroidism, osteitis deformans, acromegaly, xanthomatosis, and metastatic malignancy.

Sialography, for the visualization of the structure of the salivary glands and detection of salivary cysts, tumors and ductal stenoses, serves a useful purpose in diagnosis.

Laboratory Aids.—The fourth component, completing the diagnostic square (4 in illustration), deals with the clinical laboratory aids which are useful in the diagnosis of abnormal conditions in and about the oral cavity. Collectively, these aids and laboratory procedures are much the same as those which are common to medical practice.

Laboratory studies are selected on the basis of the specific requirements demonstrated by the individual being examined. One or more of these laboratory studies may be useful for the confirmation or denial of a tentative diagnosis. A simple example of confirmatory evidence is the case of a patient having an oral lesion showing the gross characteristics of a mucous patch. A positive darkfield examination of material from this lesion would serve to justify the diagnosis of luetic infection when correlated with other pertinent clinical findings; positive serology would certainly fortify this diagnosis.

In view of the ever-present factor of error and the possibility of the coexistence of two separate diseases, too much reliance must not be placed upon the results of any single laboratory test. For instance, in the case of the oral lesion just cited, the coexistence of lues and cancer should be considered. Martin[5] and his co-workers found a 10 per cent incidence of syphilis in a series of 375 cases of cancer of the lip.

The limited scope of this paper permits only a simple grouping of various laboratory methods which are useful in oral diagnosis. For instance, the fourth component of the diagnostic square indicates only a partial classification under broad headings and subheadings rather than a detailed list of all the various laboratory methods.

During recent years, considerable progress has been made in the formulation of new and improved clinical laboratory technics of significance to oral diagnosis. There has been encouraging progress also in the direction of better correlation and evaluation of the standard laboratory procedures with the needs of rational dental practice. The clinical laboratory offers the solution to many of our unsolved diagnostic problems and is a fruitful field for continuous dental research.

An evaluation of the various foregoing diagnostic criteria will ordinarily indicate the proper approach to rational surgical procedures by giving us to windward an anchor firmly fixed by virtue of established oral diagnosis.

Oral Surgery

Medication.—We are fortunate to have at our disposal numerous pharmaceutical preparations which are extremely useful in oral surgery. However, it goes without saying that medicaments of any kind should never be used without a thorough knowledge of their pharmaceutical properties, physiologic actions, side-effects, incompatibilities and dosages. Furthermore, they should be prescribed only in accordance with the individual requirements of each case.

The majority of office patients requiring minor surgery such as simple extractions will not require medication. Although some of these patients, particularly those having an apprehensive, nervous, high-strung disposition, will frequently present less operative difficulty and run a more comfortable course when medications are judiciously employed. Care must be exercised in using medica-

5. Martin, H.; MacComb, W. S., and Brady, J. V. Cancer of the Lip. *Ann. Surg.* 114:926 (Aug.) 1941.

tion for office patients so that they will not be released from the office, if unaccompanied by responsible escorts, until they are well-oriented, in full possession of their faculties and fully capable of handling themselves. This is particularly true when the narcotics and barbiturates, such as the opium derivatives and Nembutal are used.

The barbiturates, the more common of which are barbital, phenobarbital, Neonal, hexobarbital (Evipal), Amytal, Seconal and Pentothal, are all derivatives of barbituric acid. The more commonly used compounds are sodium pentobarbital (Nembutal) and phenobarbital. The barbiturates are excellent sedatives and hypnotics, especially useful in treating apprehensive, excitable patients because of their depressant effect upon the central nervous system. These drugs may be prescribed both pre- and postoperatively but should be used with caution in appropriate dosages. The apprehensive and recalcitrant patient is more easily managed by the administration, the night before operation, of Nembutal, grains 1½; this dosage to be repeated one hour before operation. When procaine anesthesia is employed, Nembutal has an additional physiologic advantage in being an antagonist to undesirable procaine reactions.

At the Pearl Harbor Naval Dental Clinic, satisfactory postoperative sedation has been obtained by the simple use of aspirin or acetophenetidin (Phenacetin) alone or in combination with codeine when required. Meperidine (Demerol) has also been used with good results for selected cases when it has appeared advisable to avoid respiratory depression and obtundence of the cough reflex as pointed out by Seevers.[6]

The antibiotics and sulfonamides, as bacteriostatic agents for the prevention and control of infection, have attained prominence as adjuncts in oral surgical procedures. Insofar as practicable, these agents should be selected on the basis of their specificity for the infecting organisms. The prophylactic use of penicillin to control bacteremia incident to the removal of teeth for patients with rheumatic heart disease and other systemic involvements has been emphasized by Rhoads,[7] Nadler,[8] and Knighton.[9] McGehee[10] also has suggested the prophylactic administration of the sulfonamides prior to extractions and other surgical work on patients who might be susceptible to bacterial endocarditis because of valvular heart involvement.

Anesthesia.—Renewed interest in the use of intravenous procaine for analgesia has been manifested by the work of Mushin[11] and Baker, who state that comparatively large doses of intravenous procaine can be tolerated by man provided injection is made slowly. Dosages of intravenous procaine used by them suggest a margin of safety considerably beyond the generally accepted maximal dosage of 200 mg. given in *New and Nonofficial Remedies.*[12] Everett,[13] in directing attention to the ten times greater toxicity of intravenous versus subcutaneous administration, also questions the authenticity of the arbitrary maximal dose of 200 mg. This latter author's research indicates a greater depth of anesthesia of the dental pulp by the use of a 4 per cent solution of procaine hydrochloride solution as compared with a 2

6. Seevers, M. H., Pharmacology of the Newer Synthetic Analgesics. *J. Oral Surg.* 7:34 (Jan.) 1949.

7. Rhoads, P. S., Subacute Bacterial Endocarditis: Etiologic Considerations and Prophylaxis. *M. Clin. North America.* 32:176 (Jan.) 1948.

8. Nadler, W. H., Dental Infection and Extraoral Disease. *J.A.D.A.* 39:01 (July) 1949.

9. Knighton, H. T., Round Table Discussion. *J. Am. Col. Den.* 15:150 (Dec.) 1948.

10. McGehee, W. H. O., and Green, M. W., *Pharmacology and Pharmacotherapeutics for Dentists.* Philadelphia: Blakiston Co., 1947, pp. 422-23.

11. Mushin, W. S., and Baker, L. R., Intravenous Procaine. *Lancet.* 256:619 (April) 1949.

12. Council on Pharmacy and Chemistry, American Medical Association, *New and Nonofficial Remedies.* Philadelphia: J. B. Lippincott Company, 1949.

13. Everett, F. G., A Comparison of Depth of Anesthesia and Toxicity of Two and Four Per Cent Procaine Hydrochloride Solution. *J. D. Res.* 28:204 (June) 1949.

per cent solution, both solutions containing the same amount of vasoconstrictor. Furthermore, it was determined that the 4 per cent solution was not much more toxic than the 2 per cent solution when equivalent amounts of vasoconstrictor were used.

It is generally agreed that the disagreeable side reactions encountered in local anesthesia are ordinarily due to the vasoconstrictive agent which has been incorporated in the procaine solution. The combination of procaine with any of the accepted vasoconstrictors, namely epinephrine, Suprarenin, nordefrin (Cobefrin) and phenylephrine (Neo-Synephrine) hydrochloride makes it clinically difficult to distinguish between the specific individual effects of these agents and psychosomatic influences capable of inducing syncope and shock. Transient symptoms of palpitation, tremor and anxiety, referable to a vasoconstrictor, are not uncommon and usually are of little consequence. Careful observation of the patient's pulse and respiration is the best index for symptomatic treatment, which, if promptly administered, will forestall the onset of the more serious conditions of convulsions and respiratory and circulatory failure. Lundy[14] emphasizes the need for the intravenous administration of 5 to 10 cc. of 2.5 per cent of thiopental sodium for the control of convulsions associated with local anesthesia.

Perhaps the most common fault encountered in the hypodermic administration of local anesthetics is the fault of too rapid injection. It has been repeatedly demonstrated that many of the unpleasant and trying side-effects of local anesthesia can frequently be eliminated entirely by a slow injection technic.

Preparation of Operative Field.—Surgery in and about the oral cavity is dependent upon adherence to the same fundamentals and principles which apply to any other type of surgery. Although the preparation and maintenance of a sterile field of operation in the oral cavity presents particular difficulty, nevertheless, every effort should be made to exclude or destroy micro-organisms in the operative field which may produce infection. Fortunately, patients seem to have an acquired or natural immunity to the micro-organisms of their own oral flora for, despite a lack of proper preparation, the tolerance of some patients appears to be sufficiently high to resist infection. This phenomenon as applied to the oral cavity might be termed *locus majoris resistentiae*, a place of increased resistance. Regardless of this fortuitous clinical observation, there is no justification for letting down our guard and inviting the infectious fates through the medium of poor technic. Micro-organisms from sources external to the patient's oral cavity are likely to be highly virulent if introduced into the field of operation. Therefore, in this modern era, there is no excuse for cross infection as the result of unclean hands, nonsterile instruments, sponges and dressings.

A septic mouth displaying teeth loaded with detritus, inflammation of the gingivae, soft tissue ulcerations and slough does not constitute a good surgical risk. Extractions should be postponed until such a mouth is placed in a proper state of preoperative cleanliness by the employment of hygienic procedures, if indications for emergency surgery do not exist. It is recommended that, just prior to oral surgery, the mouth be cleansed by one of two methods: by the use of a mouth wash of a 3 per cent solution of hydrogen peroxide diluted with an equal part of water, or by thoroughly spraying the mouth with some other bacteriolytic solution. In either case the solutions so used will cleanse the mouth by loosening adherent dental deposits and decreasing the bacterial count by virtue of their chemical and mechanical actions.

14. Lundy, J. S., Clinical Anesthesia. Philadelphia: W. B. Saunders Co., 1942, pp. 99, 535.

The field of operation, when possible, should be isolated by means of sterile cotton rolls or gauze. It is fully appreciated that for certain operations, such as alveolectomies and multiple extractions, it is impractical to maintain strictly an isolated field, yet every possible effort should be directed toward that end.

Surface sterilization of the field of operation may be accomplished by the topical application of any one of a number of drugs acceptable for this purpose. For the selection of a suitable agent and more detailed information on this subject, reference may be made to the current issue of *Accepted Dental Remedies* published by the American Dental Association.[15] Commonly used with satisfactory results are the quaternary ammonium compound, benzalkonium chloride (Tincture of Zephiran Chloride) and the mercurials such as nitromersol (Metaphen) and Merthiolate, the latter containing approximately 50 per cent mercury in organic combination. Regardless of the medicament used in exodontia, care should be exercised to apply the solution so that it will flow freely under gingival margins, to the depths of periodontal pockets, between the exposed bifurcations of roots and under the folds and flaps of adjacent mucous membrane. Once the field of operation has been isolated and sterilized, subsequent contamination should be avoided as much as possible.

Exodontia.—It is impractical at this time to discuss exodontia extensively. To serve the purpose of this paper, it may be helpful to consider Thoma's closed and open methods for the removal of teeth. The closed method is defined as that procedure by which the removal of one or more teeth is simply performed by the use of forceps and elevators; the open method supplements the closed method by the incision and retraction of a mucoperiosteal flap. The latter method is more familiarly known as "surgical removal." Surgery should never be more extensive than to satisfy the requirements of any particular operation. Therefore, when simple forceps manipulation meets the operative requirements of any case, the closed method or forceps technic is the procedure to choose.

In exodontia, trauma is perhaps the greatest enemy of good surgery. Forceps and elevators are ruthless instruments in inexperienced hands. When a tooth or root will not yield to moderate manipulations or pressures exerted by such instruments, the surgeon should refrain from using greater pressures, and immediately change his technic to effect an easy release of retained tooth structure.

In describing forceps movements for the removal of various teeth, it would be well to discontinue using the word "force" entirely. "Force" to many minds has a connotation of brute strength and when so interpreted has no place in surgery. It is much preferable to think of exodontia as a manipulative procedure consisting of guiding a tooth from its alveolus by a sense of feel. This sense of feel, to the skilled surgeon, serves as a red flag or a warning bell indicating that any pressure, exceeding definitely moderate limits, will produce surgical trauma or invite other complications such as fracture of the bone, alveoli or tooth. As a general rule, fracture of a root in exodontia should be intentional rather than accidental.

Post-extraction debridement is just as important as removal of the tooth. Meticulous care should be exercised to insure the elimination of infected granulation tissue, fragmented tooth structure and bone, particles of filling material and strangulated tissue tags. When mucoperiosteal flaps have been elevated, particular care should be exercised to note that all underlying debris is removed prior to their replacement, close coaptation and suturing. More attention to these

15. Council on Dental Therapeutics, American Dental Association. *Accepted Dental Remedies*, ed. 15, Chicago: American Dental Association, 1950.

matters would undoubtedly markedly decrease the incidence of postoperative complications.

Summary

A sequential record of important oral diagnostic and surgical considerations has been presented so that patient management may be approached with a clear-cut mental pattern of the diagnostic requirements in accord with modern dental practice. These requirements have been emphasized and developed only to a degree necessary to establish and underscore a basic plan, or mental pattern, sufficiently comprehensive to synchronize professional efforts with accepted standards of oral surgical practice.—*128 Fleet Post Office.*

L-ARTERENOL AS A VASOCONSTRICTOR IN LOCAL ANESTHESIA

Edward C. Dobbs,* D.D.S., and Charles De Vier,† D.D.S., Baltimore

THIS paper is a preliminary report on the usefulness of *l*-arterenol as a vasoconstrictor drug in local anesthesia. As an introduction to this newly synthesized substance a brief review of the literature is presented.

Cannon and his associates[1] found that a chemical substance is liberated at the myoneural and adenoneural junctions of the sympathetic nerves. They named this substance sympathin. Chemically sympathin resembles epinephrine but pharmacologically they are not identical.[2]

Epinephrine was shown to have a dual action, excitatory (E) and inhibitory (I), inherent in one molecule; whereas sympathin was thought to exist in two distinct pharmacologic forms, sympathin E and sympathin I.[3,4] When the sympathetic nervous system is inhibited with ergot or its active alkaloids, epinephrine will display only an I factor and sympathin E should show no response.[5]

Loewi and Bacq have denied the presence of the sympathins, accepting epinephrine as the chemical mediator of sympathetic nerve impulses.

Marrazzi and Marrazzi,[6] in an attempt to clarify this subject, postulated that sympathin I is epinephrine, whereas sym-

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*Professor of Pharmacology, Department of Pharmacology and Therapeutics, Dental School, University of Maryland.

†Instructor in Pedodontics, Dental School, University of Maryland.

1. Cannon, W. B., and Uridil, J. E., Studies on the Conditions of Activity in Endocrine Glands. *Am. J. Physiol.* 58:353 (Dec.) 1921.

2. Best, Charles H., and Taylor, Norman B., *The Physiological Basis of Medical Practice*, ed. 4, Baltimore: Williams and Wilkins, 1943, p. 691.

3. Cannon, W. B., and Rosenblueth, A., Studies on Conditions of Activity in Endocrine Organs; Sympathin E and Sympathin I. *Am. J. Physiol.* 104:557 (June) 1933.

4. Rosenblueth, A., Neuromuscular Transmission in Somatic and Autonomic Systems. Cold Spring Harbor Symposia on Quantitative Biology. 4:132, 1936.

5. Dale, H. H., On Some Physiological Actions of Ergot. *J. Physiol.* 43:163, 1906.

6. Marrazzi, S., and Marrazzi, Rose N., Chemical Structure and the Definition of Sympathin E. *Science* 107:520 (Nov.) 1948.

pathin E is nor-epinephrine or arterenol. The presence of these two substances in the body is explained on a chemical basis; both substances being derived from catechol passing through arterenol and, with methylation, into epinephrine as the final step in the biosynthesis. The presence in the tissues of either substance is dependent upon whether the molecule is methylated.

Tainter, Tuller and Luduena,[7] in the Sterling Winthrop Research Institute, early last year announced the successful preparation of *l*-arterenol. The hydrochloride salt occurs as white crystals freely soluble in water. In solution it slowly oxidizes in a manner comparable to epinephrine hydrochloride. When tested experimentally in dogs anesthetized with phenobarbital, as a pressor substance the levo-form was 27 times as potent as the dextro-form. *L*-arterenol resembles *l*-epinephrine pharmacologically, except that the depressor phase (1) is uncommon. The toxicity figures for *l*-arterenol indicate that for equivalent pressor doses the safety is approximately four times that of *l*-epinephrine.

Marrazzi and Marrazzi[8] noted the inhibitor principle of arterenol on the cervical ganglia of cats and concluded that this substance could not be sympathin E, except by departure from Cannon and Rosenblueth's definition of its being purely excitatory.

The work of Luduena, Ananenko, Siegmund and Miller[8] of the Sterling-Winthrop Research Institute reported the following: (1) *l*-arterenol is 1.77 more active than *l*-epinephrine in raising the general blood pressure in animals, (2) *l*-arterenol is a less active local vasoconstricting agent than is *l*-epinephrine on the rabbit's ear, (3) *l*-arterenol is a less potent vasoconstrictor agent than is *l*-epinephrine for combination with procaine, (4) *l*-arterenol maintains the duration of procaine anesthesia longer than *l*-epinephrine, (5) *l*-arterenol gives about the same quantitative effect on the amplitude of the heart as *l*-epinephrine and (6) *l*-arterenol is less excitatory to rats as judged by the "jiggle cage" method than is *l*-epinephrine.

With this background of study, we began an investigation on the efficacy of *l*-arterenol as a vasoconstrictor agent for local anesthetic preparations. Procaine (Novocain) 2 per cent, tetracaine (Pontocaine) 0.15 per cent, nordefrin (Cobefrin) 1:10,000 was used as the control solution. The only variation introduced into the experiment was the substitution of *l*-arterenol for nordefrin. Three concentrations of *l*-arterenol were used 1:30,000, 1:50,000 and 1:100,000. The solutions were prepared in cartridge form by the Cook-Waite Laboratories, Inc.

The patients used in this experiment were from out-patient services of the University Hospital and the Dental School. The so-called "blind-test" technic of Tainter[9,10,11] was used, which kept knowledge of the contents of the anesthetic from the operators and patients. A specific form is filled out by the operator for each patient which insures uniformity for purposes of comparison of data. It was soon evident that a satisfactory local anesthetic preparation for tooth extractions need not be satisfactory for operative procedures (see table).

There were a total of 108 patients for nordefrin and 188 patients for *l*-arterenol. Unfortunately the distribution of operative and surgery patients was not similar in the two groups, which excludes

7. Tainter, M. L.; Tullar, B. F., and Luduena, E. P., Levo-arterenol. *Science*, 107:39 (Jan.) 1948.

8. Luduena, E. P.; Ananenko, E.; Siegmund, O. H., and Miller, L. C., Comparative Pharmacology of the Optical Isomers of Arterenol. *J. Pharmacol. & Exper. Therap.*, 95:135 (Feb.) 1949.

9. Tainter, M. L.; Throndson, A. H., and Moose, S. M., Comparison of Procaine Hydrochloride and Procaine Borate as Local Anesthetics. *J.A.D.A. & D. Cos.* 24:376 (March) 1937.

10. *Idem*, Vasoconstrictors and the Clinical Effectiveness and Toxicity of Local Procaine Anesthetic Solutions. *J.A.D.A. & D. Cos.* 25:1321 (Aug.) 1938.

11. *Idem*, Alleged Clinical Importance of Buffered Local Anesthetic Solutions. *J.A.D.A.* 26:900 (June) 1939.

Efficacy of *l*-arterenol as a vasoconstrictor agent in local anesthesia. Results of study on 188 subjects and 108 controls

	Number of patients	Type of work		Grades of anesthesia						Onset of anesthesia (min.)	Duration of numbness (hrs.)	Reaction		Bleeding reaction (% each degree)
				A		B		C						
		Oper.	Surg.	No.	%	No.	%	No.	%			No (%)	Yes (%)	
P.T.N. 1:10,000 (Controls)	108	19	89	97	94	6	5	1	1	2.4	4.35	75	25	Slight..64 Mod...36 Exces...0
P.T.A. 1:30,000	21	0	21	19	90	2	10	0	0	3.3	4.5	66	34	Slight..61 Mod...36 Exces.. 3
P.T.A. 1:50,000	114	0	114	91	80	17	15	6	5	2.7	3.0	84	16	Slight..57 Mod...43 Exces..—
P.T.A. 1:100,000	53	0	53	49	91	2	3	3	6	3.2	3.2	73	27	Slight..43 Mod...50 Exces.. 7

P=procaine 2%; T=tetracaine 0.15%; N=nordefrin 0.01%; A=*l*-arterenol.

the possibility of a direct comparison of the data. Anesthesia was recorded as grades "A," "B," and "C." Grade A was anesthesia satisfactory to patient and operator, grade B was partial anesthesia in which the patient felt some pain but did not require a subsequent injection, and grade C was feeble anesthesia in which the patient required another injection. It must be kept in mind that the injections were made by dental students and interns and that the percentage of anesthetic failures may be greater than will be found in dental practice.

The duration of numbness was determined by recording the time of injection and by having the patient record on a postal card the time at which the symptoms of anesthesia wore off. The card was mailed and later attached to the patient's record. Reactions to the injected solution were recorded as "no reaction" and "untoward reactions" (nervousness, tremors, perspiration, fainting, and so forth.) The degree of hemorrhage following surgery was recorded as "slight" —less than the operator thought normal for the case; "moderate"—normal bleeding; and "excessive"—greater than normal bleeding.

In a comparative evaluation of the data on *l*-arterenol as the tartrate with nordefrin hydrochloride, racemic, it becomes evident that as a vasoconstrictor agent for local anesthetic formulas, *l*-arterenol is a satisfactory drug. It is impossible to say at this time just what the optimal concentration of *l*-arterenol should be in the anesthetic mixture, but we suspect that it is greater than 1:50,000 and less than 1:30,000. At this concentration of *l*-arterenol, the anesthetic efficacy will be about 90 per cent grade A or about equal to nordefrin 1:10,000. The duration of numbness of the two solutions would likewise be similar, about 4 hours. The freedom from untoward reaction to the injected solutions is about

75 per cent for both. The tendency for hemorrhage is also similar in the two groups.

In conclusion, our findings suggest that a concentration of *l*-arterenol greater than 1:50,000 and less than 1:30,000 will give comparable vasoconstriction to nordefrin 1:10,000 when combined in a similar anesthetic mixture. —*618 Lombard Street.*

THE CONCENTRATION OF FLUORIDES IN DRINKING WATER TO GIVE THE POINT OF MINIMUM CARIES WITH MAXIMUM SAFETY

Harold C. Hodge, Ph.D., Rochester, N. Y.

To those who have followed the fluoride story, the comparatively narrow margin between health-conferring amounts in the drinking water and mottled enamel-producing amounts is well known. By a happy coincidence, the fluoride concentration associated with a beneficial reduction in caries is a concentration producing little or no injury. There are several remarkable aspects of this coincidence. First, the amounts of fluoride involved are extremely small; only 1 ppm. apparently confers a low incidence of cavities, and only 2 to 5 ppm. is associated with endemic mottled enamel. Second, fluorides provide an unusual example of a substance which may be healthful in small amounts, but in slightly larger amounts is harmful. Third, both of these fluoride effects show up in the same structure in the body; the benefit of small amounts of fluoride is exhibited in the teeth and the injury by slightly larger amounts is exhibited, as far as we know, only by the teeth.

If a patient comes into the office with a series of questions about fluorides, the busy practitioner may not have at his finger tips a quick, easily grasped answer. Suppose the patient asks how much good fluorides will do if they are put in the drinking water, and how we know that they are safe. Answers can be given briefly and convincingly accompanied by a little sketch made of two straight lines. The purpose of this paper is to describe these two straight lines, to tell how they were obtained and to discuss their significance.

To start with, it should be recognized that many functions of the body can be expressed mathematically. It is through this approach that the two straight lines have been found. There is something appealing about any straight line relationship; the regularity and simplicity of a linear change makes such a relation easy to grasp. Many of the body functions may be described as linear processes when the effect under study is expressed in terms, not of stimulus, but of the logarithm of the stimulus. It is sometimes said that we see logarithmically, hear loga-

Professor of Pharmacology Division of Dental Research, University of Rochester School of Medicine and Dentistry, Rochester, N. Y.

rithmically, grow logarithmically, and respond to medication logarithmically. Such statements are based on the fact that when the brightnesses of two lights (or loudnesses of sounds, and so forth) are compared, the light intensity must increase stepwise on a logarithmic scale in order for the apparent brightness to increase by equal steps. In physiology, the Weber-Fechner law is so well known that these names (Weber-Fechner) are frequently used to describe the principle that effects are a function of the logarithm of the stimulus. In this paper, this test has been applied to the relationship of fluoride to mottled enamel and of fluoride to dental caries experience. In the search for a graphic presentation of the balance between benefit and injury, the extensive collection of data by Dean and his collaborators was used.

Dean[1] and his colleagues have examined more than 5,800 children in 22 cities where mottled enamel is endemic. These cities are scattered from coast to coast, north and south. The children all had had continuous exposures to the community water supplies. The water supply had not been changed so that presumably the present fluoride content represented the past exposures. The mottling had been carefully observed and averages recorded for each child in four degrees of severity: (1) "very mild"—tiny white spots undetected except by a trained examiner; (2) "mild"—opalescent or milky areas, not difficult to detect but not esthetically marring; (3) "moderate"—stained areas in, not on, the enamel; and (4) "severe"—pits, grooves, or chalky areas in the enamel surface. The average severity of mottling has been calculated for each city.

When these averages are plotted (Fig. 1) against the parts per million of fluoride (on a logarithmic scale) in the community water supplies, the data fall on two straight lines with amazing consistency. (1) Beginning at about 1 ppm. of fluoride, increasing the amount of fluoride in the water (logarithmically) produces a regular and linear increase in the severity of mottling. (2) Below 1 ppm. of fluoride, there is no indication that fluoride has any effect on the occurrence of the occasional spots or milky areas or hypoplasias that would be included in the observations of mottling.

The fact that the average degrees of mottling fall on a line is the more amazing when it is remembered that there was no quantitative basis, *a priori*, for comparing the grades of injury. For instance, there was no proof that the stained areas

1. Dean, H. T., The Investigation of Physiological Effects by the Epidemiological Method. In *Fluorine and Dental Health*, F. R. Moulton, ed. Washington: American Association for Advancement of Science, 1942, p. 23.

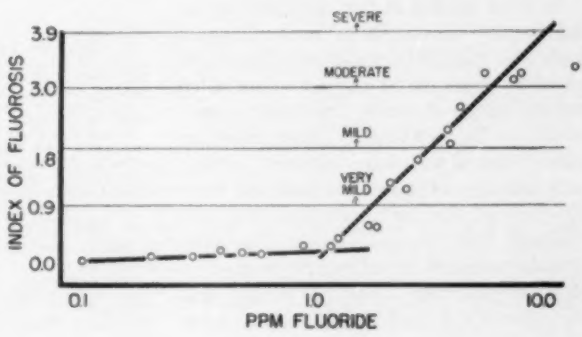

Fig. 1.—Average indexes of fluorosis plotted against the water content of fluoride (logarithmic scale)

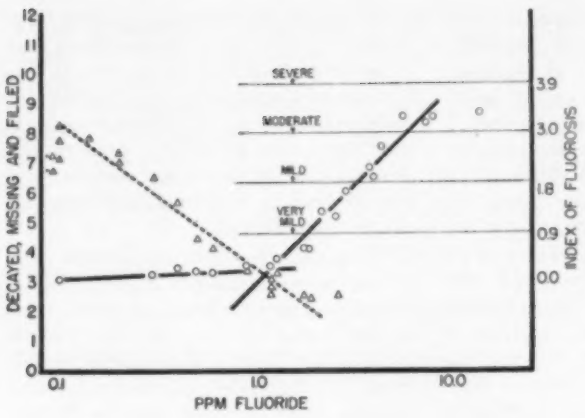

Fig. 2.—Simultaneous graph of DMF teeth (dotted line at left) and average indexes of fluorosis (two solid lines as in Figure 1) plotted against the water content of fluoride (logarithmic scale)

represented three times as severe an injury as the tiny white spots. From Figure 1, it appears that the grades of severity really represent approximately equal increments of response and were exceptionally well chosen.

The straight line intersects the "very mild" average at about 2 ppm. of fluoride. It is reasonable to wonder whether these cities include sufficient variations in climate and in water intake so that this line is universally applicable. Of course, the averages are based on the values for scores of children in each locality so that an average of "very mild" may well include a few children with moderate mottling (that is, showing stain) and many children showing no evidence of a fluoride effect.

In their studies of the epidemiology of the fluoride effects, Dean[2] and colleagues have also examined 7,257 children, aged 12 to 14 years, in 21 cities and recorded the incidence of caries, past and present, as shown by DMF teeth. These cities are also scattered across the country; in fact, in a number of instances, data on mottled enamel and on caries experience are available from the same cities. The averages for some of the cities are so high (7 to 8 or more DMF teeth per child) that they give a sad commentary on our modern civilization. On the other hand, the lower averages (2 or 3 DMF teeth per child) in cities where the water supply has 1 or 2 ppm. of fluoride, constitute one of the most convincing demonstrations that dental health may be markedly improved on a community-wide scale in the future. When the averages for the caries experience are plotted (dotted line on the left in Figure 2) against the ppm. of fluoride (on the same logarithmic scale) in the community water supplies, a regular and linear decrease in caries is demonstrated with increasing fluoride content. The consistency with which the extent of caries is proportional to the fluoride is almost incredible.[2] There are no observations on cities where the fluoride level is above about 3 ppm. and

2. *Idem*, Epidemiological Studies in the United States. In *Dental Caries and Fluorine*, F. R. Moulton, ed. Washington: American Association for Advancement of Science, 1946, p. 5.

Dr. Trendley Dean, in a personal communication, has made the following comment:

"In your figure one, I notice you use 'very mild,' 'mild,' 'moderate' and 'severe.' I have avoided using these terms as they designate a clinical entity rather than an arithmetically determined community index which I divide as follows according to the index:

0.0-0.4 negative	1.0-2.0 medium
0.4-0.6 borderline	2.0-3.0 marked
0.6-1.0 slight	3.0-4.0 very marked

"Actually it would make no essential difference in the two lines.

"According to my memory, I examined about 2000 children in 5 different states with wide differences in the type of mottled enamel before I ventured to set up a tentative classification."

the average caries values are nearly identical for cities with water supplies containing 2 or more ppm. of fluoride, so that little additional benefit might be gained at 2 or 3 ppm. as compared with the caries experience at 1 ppm. of fluoride. Obviously, more data are needed, for example; (1) on communities with widely differing climates, (2) on population age groups other than the 12 to 14 year olds, (3) on cities with higher concentrations of fluoride in the water supply.

The straight line representing caries decrease with increasing fluoride content cuts the straight line representing mottled enamel increase at 1 ppm. of fluoride or just above this figure. This intersection has a peculiar importance. It might be called the "point of minimum caries with minimum mottled enamel" or the "point of maximum usefulness of fluorides with minimum harm." Some might like to describe it as the "point of maximum health with maximum safety." This point is probably the best available guide for the selection of the concentration of fluoride to be established artificially in demonstration studies of the effectiveness and the safety of fluorides in the control of dental caries.

3. Dr. S. Lee Crump of the Statistical Section of the Atomic Energy Project, Department of Radiation Biology, and Mr. Kenneth G. Goss, calculated the equations shown in Figure 2. For the linear increase in the severity of mottling wth ppm. of fluoride greater than 1 in the drinking water, the line fitted by the method of least squares is as follows:

$$\text{Index of fluorosis} = -0.057 + 3.77 \log \text{ppm. fluoride.}$$

At 1 ppm., the index of fluorosis predicted is −0.06 and the standard error of this value is 0.06. The significance of this statement is that the mottling predicted at 1 ppm. does not differ significantly from a normal, nonmottled tooth. On the other hand, the straight line running toward the lower fluoride concentrations and nearly parallel with the base line is fitted by the following equation:

$$\text{Index of fluorosis} = 0.18 + 0.29 \log \text{ppm. fluoride.}$$

The slope of this line is 0.29 and the standard error of the slope is 0.04. The significance of this statement is that there really is a regular falling off in average mottling below 1 ppm. even though the total changes are of negligible biologic (esthetic) significance.

The equation for the line relating the decrease in caries to the increase in content of fluorides in the drinking water is as follows:

$$\text{Number of DMF teeth per 100 children} = 339 - 464 \log \text{ppm. fluoride.}$$

This equation gives, for communities with drinking water containing 1 ppm. fluoride, a predicted incidence of decay of the order of 360 DMF teeth per 100 children and the standard error of this figure is 19. This means that, when water containing 1 ppm. fluoride is drunk by children, it is probable that the average 12 to 14-year-old will have between 3.0 and 4.0 "bad" (DMF) teeth. DMF means "decayed, missing or filled" teeth.

▲

The Uses of Science.—When in difficulties, the masters of the totalitarian states of the past, the Babylonian and New Egyptian empires, summoned their sorcerers and magicians in the same way as their successors of today call upon the scientists. There is no reason to suppose that modern successors to Daniel and Moses will be lacking to put to rout this improper use of science by an appeal to higher Authority; . . . the medieval idea of the subordination and coordination of all sciences under theology, their queen, may not be as foolish a notion as it may have appeared fifty or a hundred years ago.—*Joseph V. Walker, "Bacterial Warfare," The Lancet 256:501, March 19, 1949.*

THE TOXICITY OF FLUORIDES IN RELATION TO THEIR USE IN DENTISTRY

Gerald J. Cox,* Ph.D., Pittsburgh and
Harold C. Hodge,† Ph.D., Rochester, N. Y.

It has been our purpose to review the toxicology of fluorides only in the aspects related to dental health. The list of dental uses of fluorides is growing and has already included the following surprisingly large number of items: (1) Fluoridization of water and related preeruptive procedures for the prevention of dental caries. (2) Topical application of fluorides for control of dental caries. (3) Fluoride pastes to desensitize dentin. (4) Toothpastes and powders. (5) Mouth wash. (6) Fluoride plus vitamin tablets. (7) Chewing gum.

With the increased use of fluorides, it is proper to insist that due attention be paid to the possible hazards and to insist that there be a large factor of safety. Fluorine and its compounds have long been known as poisons. In the following discussion, the toxic effects of fluoride are grouped under four main headings: Acute Poisoning, Chronic High-Grade Poisoning, Chonic Low-Grade Poisoning, and Local Action. In each case, after the toxic effects have been described, an evaluation has been made of the possibility of such effects appearing in conjunction with the use of fluorides in dentistry.

It is our intent to indicate the safety of the therapeutic uses of fluorides, and it is not our intent to warn against the uses of fluorides in dentistry. This discussion, however, should alert the users to the dangers of carelessness and misuse, dangers to both the subjects and the operators.

Objections to the uses of fluorides in dentistry have come from various sources. These have been mainly from the specialists in various fields who are uninformed about the proved possibilities of fluorides. Those who have competing procedures have advanced their wares by attacks on fluorides. Some who have seen only the bad effects of fluorides refuse to accept the good. There have been dire warnings of bad effects, characteristically naming nothing specific. It has been the vogue to proceed cautiously in the fluoridization of water and such caution implies more the fear of the unknown than doubt of the benefits.

The word "fluorine" as used in this paper refers to fluoride ions or the fluorine portion of a compound containing the element.

Extensive reviews of the toxicology of fluorine are available[1-8] and many of the papers on mottled enamel and on dental caries present evaluations of the literature

*Director of Dental Research, School of Dentistry, University of Pittsburgh.

†Professor of Pharmacology, Division of Dental Research, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.

The opinions expressed are those of the authors and do not necessarily reflect the opinions of the Council on Dental Therapeutics.

1. DeEds, F., Chronic Fluorine Intoxication. *Medicine* 12:1 (Feb.) 1933.

2. McClure, F. J., Review of Fluorine and Its Physiological Effects. *Physiol. Rev.* 13:277 (July) 1933.

3. Roholm, K., *Fluorine Intoxication*. London: H. K. Lewis & Co., Ltd., 1937.

4. Peirce, A. W., Chronic Fluorine Intoxication in Domestic Animals. *Nutrition Abstr. & Rev.* 9:253 (Oct.) 1939.

5. Gettler, A. O., and Ellerbrook, L., Toxicology of Fluorides. *Am. J. Med. Sc.* 197:625 (May) 1939.

6. Roholm, K., Fluorvergiftung. Eine Übersicht über die Rolle des Fluors in der Pathologie und Physiologie. *Ergeb. d. inn. Med. u. Kinderh.* 57:822, 1939.

7. Greenwood, D. A., Fluoride Intoxication. *Physiol. Rev.* 20:582 (Oct.) 1940.

8. de Senarclens, F., Contribution à l'Étude de l'Ostéopathie Fluorique. *Helvet. Med. Acta.* 8:379 (Aug.) 1941.

on fluorine toxicity. Symposia have dealt with the whole problem of fluorine in its relations to dental health with consideration of its toxicity,[9-11] and McClure[12] has summarized knowledge of fluoride effects published during the period 1934 through September 1948.

Acute Toxicity

Effects of Oral Doses on Man.—Fluorides rank among the substances whose ingestion in small amounts can cause death within a few hours. Rabuteau[13] administered sodium, potassium, ammonium and other fluorides to cats, dogs, rabbits and frogs and noted salivation and vomiting. For extension of the findings to man he took by mouth 0.25 Gm. of sodium fluoride in 25 ml. of water. (This is a 1 per cent solution of sodium fluoride or approximately 4,500 ppm. as fluoride ion. It is approximately 1 fluidounce of half the 2 per cent strength recommended for topical application of fluorides.) He noted a slight nausea with epigastric sensations which lasted about five hours. Salivation was intense for about a half-hour and noticeable up to one and one-half hours. He noted an itching sensation in trunk, hands and feet that lasted about a week. It is important to note that Rabuteau swallowed approximately 1 fluidounce of a 1 per cent sodium fluoride solution; that is, one of half the strength recommended for topical application of sodium fluoride.

Baldwin[14] swallowed sodium fluoride experimentally, in increasing doses. He reported:

> 0.03 gm. swallowed with some bread produced no effect. Neither did 0.09 gm. taken one hour later, except a little salivation. 0.25 gm., however, taken two days afterward on an empty stomach, produced nausea in two minutes. This gradually increased in severity for twenty minutes when the period of greatest intensity was reached. There was a largely increased flow of saliva and some retching but no vomiting occurred at that time though the desire was very great. The nausea gradually subsided so that luncheon could be eaten (without relish), but no vomiting took place immediately on its completion which was two hours after taking the poison. Slight nausea continued throughout the following day but disappeared on the second day.

That Rabuteau and Baldwin were fortunate is indicated by the findings of Gettler and Ellerbrook.[8] They analyzed the vital organs and tissues from five fatal cases of fluoride poisoning. Since all the materials were not submitted for analysis, they supplemented their data with analyses of tissues from dogs experimentally poisoned. They found the fluorine contents of the organs of the two species after acute fluoride poisoning to be within the same range and no difference whether death was caused by sodium fluoride or fluosilicate. The fluorine content of the urine was highly variable.

Following a brief review of estimates by others of the minimum lethal dose of fluorine they wrote:

> The reason why such wide variations as to the lethal dose exists may be (a) the amount of fluorine actually taken by the subject is only a guess; (b) some of the ingested fluorine is lost in the vomitus; (c) the fluorine remaining in the gastro-intestinal tract (unabsorbed) has no bearing on the cause of death; that part of the poison which has been absorbed into the circulation and tissues is solely responsible for the death of the individual; (d) fluorine is very rapidly excreted in the urine.

Gettler and Ellerbrook then calculated from the analyses of human and dog tissues that death could be caused in a 140

9. Moulton, F. R. (editor), *Fluorine and Dental Health*, Washington: American Association for the Advancement of Science, 1942, 101 pp.

10. Moulton, F. R. (editor), *Dental Caries and Fluorine*, Washington: American Association for the Advancement of Science, 1946, 111 pp.

11. Gies, W. J. (editor), *Fluorine in Dental Public Health*, New York: New York Institute of Clinical Oral Pathology, 1945, p. 62.

12. McClure, F. J. Mineral Metabolism (Fluorine and Other Trace Elements.) *Ann. Rev. Biochem.* 18:335, 1945.

13. Rabuteau, A. P. A., Experimental Study on the Physiological Effects of Fluorides and of Metal Compounds in General. *Thesis*, Paris, 1867.

14. Baldwin, H. B., The Toxic Action of Sodium Fluoride. *J. Am. Chem. Soc.* 21:517, 1899.

pound man by absorption of as little as 105 mg. of fluorine. The dosage taken by mouth by both Rabuteau[13] and Baldwin[14] was approximately 110 mg; the amount absorbed is unknown.

Approximate Lethal Dose for Man.—It is unnecessary to stress the difficulty of estimating accurately the dose of fluoride to kill the average man. In animals, for example in the rat, the LD50 (dosage from which 50 per cent of the animals die) is of the order of 50 mg. per kilogram of body weight. Since fluoride is one of the general protoplasmic poisons, it may well be that an average fatal dose for man is of the same order of magnitude. It would be impossible to cite all of the estimated doses in fatal poisoning cases that have been recorded in the literature. In the brevity required by this review, instead, a few typical examples are cited in Table 1.

Table 1.—Examples of the relation of various dosages of fluorides to the lethal dosage in man

Probable dose	Effect	Compound
100 mg. or more	Death predicted[8]	Sodium fluoride (fluosilicate)
0.2—0.6 Gm.	71 cases with recovery[15]	Sodium fluoride
0.7—1.0 Gm.	Fatal[16]	Sodium fluosilicate
1 Gm. or more	60 fatal cases 52 survived[3]	Fluoride and fluosilicate
5 Gm.	Fatal[19]	Fluoride or fluosilicate
5—9 Gm.	Recovery[14]	Sodium fluoride
5—10 Gm.	47 fatal of 263 cases[17]	Sodium fluoride
95 per cent paste in water, 50-80 Gm.	Recovery[18]	Sodium fluoride

It is difficult to judge the minimum lethal dose from the above, mainly because the estimation of the doses is quite uncertain and fluoride has been ejected in unknown amount through vomiting. Roholm's[3] opinion that 4 Gm. is the minimum amount of sodium fluoride known to have caused death of an adult has been widely accepted.[19] Black, Kleiner and Bolker[20] claimed that oral doses of 20 to 50 mg. of sodium fluoride given four times a day to children 3½ to 6 years of age, or 80 mg. doses given four times a day to adults, were not toxic. The sodium fluoride was given with a suspension of aluminum hydroxide. Sharpless[21] has shown that an aluminum salt fed in excess of sodium fluoride prevents mottling of the enamel of rat incisors. Black, Kleiner and Bolker stated: "If taken alone, sodium fluoride causes gastritis and regurgitation. . . ."

Mechanism of Acute Fluoride Poisoning.—While the mechanism of acute fluoride poisoning is still obscure, studies from a variety of sources have indicated how some of the effects arise. The nausea, vomiting and the diarrhea in some cases may be attributed to the ingestion of the hypertonic salt solution which is irritating to the mucosa of the stomach. The local action of fluorides on the mucosal tissues certainly contributes to these ef-

15. Ingraham, H. S., and Flood, A. J., An Outbreak of Acute Fluoride Poisoning. *New York State J. Med.* 43:41 (Jan. 1) 1933.

16. Gellerstedt, N., Zur pathologischen Anatomie der akuten Fluornatriumvergiftung. *Deutsche Ztschr. f. d. ges. gerichtl. Med.* 19:473, 1932.

17. Lidbeck, W. L.; Hill, I. B., and Beeman, J. A., Acute Sodium Fluoride Poisoning. *J.A.M.A.* 121:806 (Mar. 13) 1943.

18. Peters, J. H., Therapy of Acute Fluoride Poisoning. *Am. J. M. Sc.* 216:678 (Sept.) 1948.

19. McNally, W. D., Four Deaths Caused by Sodium Fluoride. *J.A.M.A.* 81:811 (Sept. 8) 1923.

20. Black, M. M.; Kleiner, I. S., and Bolker, Herman, The Toxicity of Sodium Fluoride in Man. *New York State J. Med.* 49:1187 (May) 1949.

21. Sharpless, G. R., Limitation of Fluorine Toxicosis in the Rat with Aluminum Chloride. *Proc. Soc. Exper. Biol. & Med.* 34:360 (May) 1936.

fects. When absorbed, fluoride forms strong complexes with calcium; for example, Rabinowitch[22] described a case of suicide by ingestion of sodium fluoride. The subject did not vomit. He showed spasms of the hands and feet and died of respiratory failure three hours and five minutes after ingestion of the poison. A blood sample taken a few minutes before death showed 2.6 mg. of calcium per 100 ml. of serum, believed by Rabinowitch to be the lowest ever observed in man. Normal is 9 to 11.5 mg. The low blood calcium may be the basis for the twitchings observed in severely poisoned individuals.

Probably the most important actions of fluorides are those on enzymes. Some of the basic and necessary metabolic processes in the cell are stopped by concentrations of fluoride such as are found in acute poisoning. These changes are comparable to those seen in high-grade anoxia and are the basis for describing fluorides as general protoplasmic poisons.

Treatment of Acute Fluoride Poisoning.—Roholm[3] says of fluoride poisoning:

> On the whole, the prognosis must be characterized as bad; the mortality is high. Whether or not there is vomiting is a matter of vital importance to the prognosis. It is presumable that the quantity and nature of the stomach contents also have some bearing. It is possible that an existing anacidity reduces the possibility of absorption and thereby improves the prognosis.
>
> On the whole, no definitely effective treatment has been used. The rational therapy is intravenous injection of a soluble calcium salt, to which must be added gastric lavage and peroral administration of a solution of calcium chloride, perhaps milk. Treatment must be commenced quickly to have any chance of being effective.

For treatment of acute fluoride poisoning by mouth, Rabinowitch[22] recommended thorough washing of the stomach with lime water or a weak solution of calcium chloride if lime water is not immediately available. If neither is available, water should be used repeatedly in small amounts. He recommended intravenous injection of a 10 per cent calcium gluconate solution without delay on appearance of any signs suggestive of tetany, or very cautious injection of a more dilute solution of calcium chloride if the gluconate is not immediately available.

Peters[18] reported the case of a 16 year old girl who swallowed with suicidal intent:

> . . . about 4 ounces of a thicker-than-cream suspension of 95 per cent sodium fluoride in water (estimated to have been 50-80 gm.), the largest dosage from which a human has been known to recover. Undoubtedly early vomiting ejected much of this.

Peters stressed the use of lime water by gastric lavage and calcium gluconate for intravenous injection for relief of acute poisoning by ingested fluoride. He followed the suggestions of Rabinowitch[22] in the emergency described above and credits Maletz,[23] in 1935, as first clearly recognizing the importance of calcium therapy, though Stanton and Kahn,[24] in 1915, used about a gallon of a solution of lime water and calcium chloride for washing the stomach in the successful treatment of a 19 month old girl who had swallowed a roach powder containing about 50 per cent sodium fluoride.

The recommendations of Peters[18] are as follows:

> 1. Act quickly. Fluoride may kill in a few minutes, and 3 to 4 hours after ingestion is the most frequent reported lethal interval.
>
> 2. Start intravenous therapy with glucose in normal saline promptly, both to maintain blood sugar in case of hepatic glycogen depletion, and to have a venous channel available for transfusion. Shock may kill despite calcium.
>
> 3. Wash the stomach gently with saline, or preferably with lime water, and then give lime water at frequent intervals.

22. Rabinowitch, I. M., Acute Fluoride Poisoning. *Canad. M.A.J.* 52:543 (Apr.) 1945.

23. Maletz, L., Report of Fatal Case of Fluoride Poisoning. *New England J. Med.* 213:570 (Aug. 22) 1935.

24. Stanton, J. N., and Kahn, M., Sodium Fluoride Poisoning. *J.A.M.A.* 64:1983 (June 12) 1915.

4. Have calcium available for intravenous administration and watch closely for signs of tetany. Tetanic death is often rapid.

5. Maintain high urine volume with parenteral fluid.

6. Wash away vomitus, feces and urine promptly to prevent external burns.

The identification of symptoms of acute fluoride poisoning and recommendations for treatment given by the Council on Dental Therapeutics in *Accepted Dental Remedies*[25] are as follows:

Symptoms.—Nausea and vomiting; burning, cramp-like abdominal pains; diarrhea. Sometimes tremors or convulsions. Greyish blue cyanosis. Urine and blood show presence of fluoride.

Treatment.—Copious gastric lavage with lime water or 1 per cent calcium chloride solution. Calcium gluconate 1 Gm. (10 cc. of 10 per cent) intramuscularly or calcium chloride 1 Gm. (10 cc. of 10 per cent) in water, intravenously. Carbon dioxide-oxygen inhalation, or artificial respiration if necessary. External heat. Intravenous glucose or normal saline if necessary.

Is Use of 2 per cent Sodium Fluoride Solution Hazardous?—In our opinion, the application of 2 per cent sodium fluoride in water solution topically is perfectly safe under the conditions of application in the dental office by the dentist or dental hygienist. It has been estimated that at most 2 cc. of the 2 per cent solution are used in a single application. This volume would contain 20 mg. of fluorine (40 mg. of sodium fluoride), most of which is rinsed from the teeth and ejected from the mouth if the customary practice as described by Knutson[26] is followed. Even if the patient swallowed the entire amount, there would be no physiological effect. The patient would not be nauseated or harmed.

The 2 per cent solution of sodium fluoride should never under any circumstances be placed in the home. The 2 per cent aqueous solution of sodium fluoride is colorless, odorless and has only a salty taste. Ten cubic centimeters of this solution accidentally drunk by a baby would give a dose of 100 mg. of fluorine —the lethal dose cited by Gettler and Ellerbrook[8] for an adult. If bottles of 2 per cent sodium fluoride solution are permitted in homes, it will only be a matter of time before records of children's deaths will be found in the dental and medical literature. The 2 per cent solution of sodium fluoride is too toxic to be permitted in homes.

Chronic Poisoning: High-Grade

The classical effects of chronic poisoning seen industrially, and in those ingesting drinking water with excessive concentrations of fluorides, are stiffness of the joints, exostoses, moth-eaten bones, calcification of the ligaments and, of special interest to dentists, changes in the roentgenograms of the jaw bone characterized by heavy trabeculae.[27,28]

Stiff Backs.—Shortt, Pandit and Raghavachari[29] observed stiffness of the backs of individuals over 30 years of age in districts near Madras, India. It was a common belief that the condition derived from the water supply. Shortt and his colleagues noted severe mottled enamel and found from 0 to 10 ppm. fluorine in the waters. Pandit, Raghavachari, Rao and Krishnamurti[30] estimated, on the

25. Council on Dental Therapeutics, *Accepted Dental Remedies*, ed. 15, Chicago: American Dental Association, 1950, p. 202.

26. Knutson, J. W., Sodium Fluoride Solutions: Technic for Application to the Teeth. *J.A.D.A.* 36:37 (Jan.) 1948.

27. McGarvey, C. J., and Ernstene, A. C., Skeletal Changes in Chronic Fluorine Intoxication. Report of a Case. *Cleveland Clin. Quart.* 14:108 (Apr.) 1947.

28. Dale, P. P., and McCauley, H. B., Dental Conditions in Workers Chronically Exposed to Dilute and Anhydrous Hydrofluoric Acid. *J.A.D.A.* 37:131 (Aug.) 1948.

29. Shortt, H. E.; Pandit, C. G., and Raghavachari, T. N. S., Endemic Fluorosis in the Nellore District of South India. *Indian M. Gaz.* 72:396 (July) 1937.

30. Pandit, C. G.; Raghavachari, T. N. S.; Rao, D. S., and Krishnamurti, V., Endemic Fluorosis in South India. Study of Factors Involved in Production of Mottled Enamel in Children and Severe Bone Manifestations in Adults. *Indian J. M. Research* 28:533 (Oct.) 1940.

basis of 6 pints of daily water ingestion, that an intake of 5.4 mg. of fluoride produced a slight incidence of stiff backs; in districts with the most extreme cases the estimates ranged up to 24 mg. They said "bone affections were fairly prevalent" in a town "with a fluoride content of only 2 ppm. in their water supply." Osteosclerosis has been reported associated with mottled enamel by Capizzano, Paterson Toledo, Megy and Valotta;[31] Capizzano, Valotta and Megy;[32] Mascheroni, Muños, and Reussi.[33] Ockerse[34] found 8 cases of osteoporosis in South Africa associated with mottled enamel from 12 ppm. fluorine in the water supply. Kemp, Murray and Wilson[35] described two cases with skeletal changes associated with severe mottled enamel. Linsman and McMurray[36] found severe osteosclerosis in a man, age 22, with a history of exposure to 12 ppm. fluorine in water. This case at autopsy showed a cystic condition of one kidney and atrophy of the other. There was a history of kidney injury at 15 years. They speculated as to whether the fluorine had aggravated the kidney injury or retention of fluorine had promoted development of osteosclerosis. Lyth[37] described four cases of spondylitis in Chinese associated with mottled enamel and fluorine in the drinking water up to 13 ppm.

Although the mechanism by which high-grade chronic fluorine poisoning develops has not been described, attention should be drawn to the fact that all of the changes are associated with derangements in mineral metabolism. It has been known for some time that fluoride is a powerful poison of the phosphatase essential for calcification. Perhaps this action is responsible for the development of crippling fluorosis.

Daily Fluoride Intake Associated With Chronic High-Grade Fluorosis.—From analyses of the urinary excretion of fluoride by cryolite workers in Denmark, the opinion has been stated that crippling fluorosis develops in individuals whose intake of fluoride exceeds 20 mg. per day for a period of 10 to 20 years. The fluoride intake of the persons referred to above who developed crippling fluorosis from drinking fluoride-rich waters is unknown, although amounts of the order of 20 mg. or more per day are plausible.

McClure[10] has reviewed the literature on the excretion of fluoride and has concluded that at least 90 per cent of ingested fluoride appears in urine, feces and sweat when the amounts taken are in the ranges proposed for fluoridization of water. Certainly there is fluoride retained by the bones as there is ample evidence that the fluorine content of bones is increased with age. There are available reliable methods for the estimation of urinary fluorides. Consequently, in industries with known fluoride exposures, urinary analyses should prevent the occurrence of this crippling disorder. In the case of individuals drinking water containing excessive amounts of fluoride, analyses of the water supply and of the urine should make possible the control of this hazard.

Is There Danger of Chronic High-Grade Fluorosis?—The volume of 2 per cent sodium fluoride solution applied in a topical treatment, as was stated, might be 2 cc. containing 20 mg. of fluorine. On

31. Capizzano, N.; Paterson Toledo, R.; Megy, F., and Valotta, J., Osteopetrosis generalizada ¿enfermedad endémica regional en la República Argentina? Comentarios sobre nueve casos. *Rev. med. y cien. afines* 1:15 (Aug. 30) 1939.

32. Capizzano, N.; Valotta, J., and Megy, F. R., Osteopetrosis en el territorio de la Pampa. *Rev. Med. (Buenos Aires)* 2:19 (Jan.) 1940.

33. Mascheroni, H. A.; Muñoz, J. M., and Reussi, C., Manifestaciones óseas de la fluorosis endémica. *Rev. Soc. argent. de biol.* 15:417 (Nov.) 1939.

34. Ockerse, T., Endemic Fluorosis in Pretoria District. *South African M. J.* 15:261 (July 26) 1941.

35. Kemp, F. H.; Murray, M. M., and Wilson, D. C., Spondylosis deformans in Relation to Fluorine and General Nutrition. *Lancet* 2:93 (July 23) 1942.

36. Linsman, J. F., and McMurray, C. A., Fluoride Osteosclerosis from Drinking Water. *Radiology* 40:474 (May) 1943.

37. Lyth, O., Endemic Fluorosis in Kweichow, China. *Lancet* 1:233 (Feb. 16) 1946.

the basis of the best available opinion, if this entire amount were swallowed and if the treatment were continued daily for ten to twenty years, crippling fluorosis might occur. Such a prospect is so fantastic that no further comment is needed.

The question might be raised as to the accumulation of fluoride. For example,[38] if fruits and vegetables are sprayed with a fluoride insecticide and if they are cooked in a fluoride water (1 ppm.) in which the fluoride content is increased by evaporation of the water, and if the patient is drinking 1 ppm. fluorine water, and taking fluoride vitamin tablets containing 1 mg. of fluorine, and is using a fluoride dentifrice, would all of these sources of fluoride combine to exceed a limit of safety from crippling fluorosis? The answer, in our opinion, is negative. It is almost impossible to imagine any set of circumstances in which the fluoride intake might become sufficient to bring about chronic high-grade fluorosis, if the fluorine content of the water is of the order of 1 ppm.

Chronic Poisoning: Low-Grade

Since mottled enamel was first effectively described by Black and McKay in 1916, this disfiguring hypoplasia has been the object of a continued and large-scale epidemiological study. The condition has been graded as to severity by Dean[39] into six classes or, as distinct from "normal": (1) questionable—a few white flecks in groups of about 25 children; (2) very mild—small opaque paper white areas scattered irregularly, involving less than 25 per cent of the tooth surface; (3) mild—the areas involve at least half of the tooth surface and a few brown stains may occur; (4) moderate—all of the tooth surface is involved with no change in tooth form, except minute pitting; brown stain is frequent; (5) moderately severe—a greater depth of the enamel is involved; pitting is more frequent with brown stain, if present, generally deeper in hue; (6) severe—hypoplasia so marked the form of the teeth is at times affected; pits are deeper and often confluent; stains are brown to chocolate or black.

The histogenesis of mottled enamel has been shown to involve more or less acutely hypoplastic and ultimately cuboidal ameloblasts. With the loss of form of the ameloblasts goes a loss of function so that, in advanced lesions, the ameloblast activity is almost entirely gone. The failure of the ameloblast produces the loss of tooth structure seen in severe mottling. At present, the origin of the stain is not understood. The interrod cement substance may be influenced as well as the formation of the rods themselves. The changes responsible for the opalescence and for the tiny white spots in the mild grades of mottling are likewise not understood. Since mottled enamel arises from interference with ameloblastic activity, it is obvious that the condition can be produced only during the first eight years of life when teeth are calcifying.

DeEds[40] found *in vitro* depression of bone phosphatase activity by sodium fluoride in "one two-hundredth molar" concentration. This is of the order of 100 ppm. fluorine.

Daily Fluoride Intake Associated With Mottled Enamel.—H. V. Smith[41] concluded from observations in Arizona:

> The evidence indicates strongly that any water with a fluorine content of 0.9 ppm. (when analyzed by the Foster, Willard, or Sanchis methods) or over is dangerous from the standpoint of probable damage to the teeth.

Badger[42] has also reported cases of

38. Marcovitch, S.; Shuey, G. A., and Stanley, W. W., Cryolite Spray Residues and Human Health. *U. Tennessee Agr. Expt. Sta. Bull.* No. 162 (Nov.) 1936, 46 pp.

39. Dean, H. Trendley, Classification of Mottled Enamel Diagnosis. *J.A.D.A.* 21:1421 (Aug.) 1934.

40. DeEds, F., Fluorine in Relation to Bone and Tooth Development. *J.A.D.A.* 23:568 (Apr.) 1936.

41. Smith, H. V., Potability of Water from Standpoint of Fluorine Content. *Am. J. Pub. Health* 25:434 (Apr.) 1935.

42. Badger, D. C., Toxic Level of Fluorine in Water Supplies. *Am. J. Dis. Child.* 78:72 (July) 1949.

mottled enamel in children drinking from a community water supply in New Mexico containing 0.9 ppm. fluorine. But Dean, Jay, Arnold, McClure and Elvove[43] reported only 47 per cent of the children of Galesburg, Illinois, "showed some form of mottled enamel generally of a very mild type. The remainder, 129, were classified as normal or questionable." The fluorine concentration of Galesburg water was twice that considered dangerous by Smith and Badger. The probable explanation of these differences lies in the hot, dry climate of Arizona and New Mexico compared to the relatively humid, cooler environment of Galesburg, Illinois. It is, therefore, advisable to consider that in the fluoridization of water supplies, in the summer mottled enamel can be caused by fluorine at 1 ppm. whereas in the winter months a higher level may be tolerated.

The conclusions of Smith[41] apparently early dominated the control of fluorides in water supplies as the drinking water standards for the United States were set tentatively at 1.0 ppm. fluorine as a maximum.[44] An editorial[45] referred to 1.0 ppm. as the permissible maximum. The limit for fluorine in water supplies was set at 1.5 ppm. in 1946.[46] Enforcement of this arbitrary limit would call for modification or rejection of the water supply of Galesburg, Illinois.

The relationship between severity of mottling and the fluoride content of communal water supplies has been clearly established by the often quoted investigations of Dean and colleagues. Hodge[47] has found a simple, linear relationship between the logarithm of the fluorine content of a community water supply and (a) the index of mottled enamel and (b) the reduction of dental caries. He has suggested that the point of intersection of the lines "might be called the 'point of minimum caries with minimum mottled enamel' or the 'point of maximum usefulness of fluorides with minimum harm.'"

The treatment of mottled enamel as an endemic disease obviously is a problem of prevention. Many cities carried out expensive procedures to lower the fluoride content in the drinking water to nonmottling levels following the demonstration in 1931 by Smith, Lantz and Smith,[48] and independently by Churchill,[49] that fluoride was responsible for this dystrophy. Where fluorine is present in waters at levels to cause mottled enamel two procedures are available: seek other sources of water or remove the fluorides. In either case the level of fluorides should not be reduced below 1 ppm. and it may be found advisable in many localities to leave the amount of fluorine at higher levels for most of winter, spring and fall. Therefore if the source of water is changed it may be advisable to blend the new water with the old to obtain the desired fluorine level.

Nichols[50] has reviewed the methods of treatment of water to reduce the fluorine content. Two general procedures are available, namely, those based on reaction of the fluoride with hydroxyapatite, variously prepared, or with alumina. The latter reagent is of further importance since, if sodium aluminate treatment of water supplies is used, addition of sodium fluoride for caries prevention must be

43. Dean, H. T.; Jay, P.; Arnold, F. A. Jr.; McClure, F. J., and Elvove, E., Domestic Water and Dental Caries Including Certain Epidemiological Aspects of Oral L. Acidophilus. *Pub. Health Rep.* 54:862 (May 26) 1939.

44. Anonymous, Public Health Service Drinking Water Standards. *Pub. Health Rept.* 58:69 (Jan. 15) 1943.

45. Editorial, Chronic Fluorine Intoxication. *J.A.M.A.* 123:150 (Sept. 18) 1943.

46. Anonymous, Public Health Service Drinking Water Standards, 1946. *Pub. Health Rep.* 61:371 (Mar. 15) 1946.

47. Hodge, H. C., Concentration of Fluorides in Drinking Water to Give the Point of Minimum Caries with Maximum Safety. *J.A.D.A.* This issue, p. 436.

48. Smith, M. C.; Lantz, Edith M., and Smith H. V., The Cause of Mottled Enamel. *Science* 74:244 (Apr. 27) 1931; *Arizona Agr. Expt. Sta. Tech. Bul.* 32:253 (June 10) 1931.

49. Churchill, H. V., The Occurrence of Fluorides in Some Waters of the United States. *Ind. Eng. Chem.* 23:996 (Sept.) 1931.

50. Nichols, M. S., Occurrence, Pathological Aspects, and Treatment of Fluoride Waters. *Am. J. Pub. Health* 29:991 (Sept.) 1939.

done after the lime flocculation. Otherwise an appreciable amount of the added fluoride will be lost.

To solve the esthetic problem for the victims of mottled enamel, local treatments are sometimes employed (Younger, reference 9, p. 50). However, porcelain facings, jacket crowns or even dentures may be required.

Is There a Danger of Mottled Enamel From Prophylactic Applications of Fluorine?—When fluorides are added to public water supplies, the total fluoride content is usually set at 1 ppm. or slightly more. This concentration has been indicated as able to confer most of the reduction in dental caries attainable by the use of fluorides. From the charts shown by Hodge,[47] it is clear that, on the average, the mottling in persons drinking such water will be less than the "very mild" category. It should be reiterated that in the community from which such an average figure is obtained, there will be a few persons who develop "very mild" or "mild" mottling. It is our opinion that this mottling will never be disfiguring.

What of the person drinking such water who receives fluoride in a topical application? The extra amount of fluorine ingested on the day of treatment may well be several milligrams but should not exceed 20 mg. Studies of the rate of excretion of fluorides indicate that a single dose of fluorides is rapidly excreted, so that the effects would not be produced after a day or two. Consequently, even a program of three or four applications at weekly intervals once or twice a year would not add enough fluoride to have any recognizable action. On the other hand, it is possible that persons drinking water containing 1 ppm. who also ingest fluoride tablets daily during the first eight years of life, might be able to increase the total fluoride absorbed by the body to the extent of producing disfiguring mottling. The amounts of fluoride that may be absorbed from the use of fluoride-containing dentifrices, mouth washes or chewing gum is not known at present so that these sources cannot be evaluated.

A possible future danger of mottled enamel lies in over-enthusiasm to provide fluorides for the prevention of dental caries. Proposals have been made for the use of bone meal[51] because of its fluorine content, which may range up to 1,000 ppm. Fluoride-containing tablets are being sold.[52] "The food in the diet will contribute on the average 0.20-0.30 mg. of fluorine daily"[53] but there are foods which have high fluorine content such as canned salmon, including bones, containing up to 6 ppm.[54] and fish pastes with up to 9 ppm.[55] McClure has recently summarized the data of the fluorine content of foods.[56]

Safety of Prophylactic Applications of Fluorine.—Hodges, Fareed, Ruggy and Chadnoff[57] examined 86 persons from age 7½ to 71 years in towns with fluorine from 1.2 to 3.0 ppm. in the water. They found no evidence by roentgenography of sclerosis of the skeleton.

Bone Fracture; Growth. — McClure[58] studied the relation of fluoride from water supplies to the height, weight and bone-fracture experience of 1,458 high school boys and 2,529 young men tak-

51. Bransom, C. B., Practical Fluorine Therapy in Dental Caries Control. *J.A.D.A.* 31:71 (Jan.) 1944.

52. Strean, L., and Besudet, J. P., Dental Caries Inhibited by Fluoride—Vitamin Tablets. *Dental Survey* 22:689 (April) 1946.

53. McClure, F. J., Ingestion of Fluorine and Dental Caries. *J. D. Res.* 26:340 (Aug.) 1947.

54. Lee, C. F., and Nilson, H. W., Study of the Metabolism of Naturally Occurring Fluorine in Canned Salmon and Mackerel. *Bur. Fisheries Investigational Report* 44:1, 1939.

55. Harvey, W., Fluorine in Fish Pastes. *Nature* 155:175 (Feb. 10) 1945.

56. McClure, F. J., Fluorine in Foods, Survey of Recent Data. *Pub. Health Rep.* 64:1061 (Aug. 26) 1949.

57. Hodges, P. C.; Fareed, O. J.; Ruggy, G., and Chudnoff, J. S., Skeletal Sclerosis in Chronic Sodium Fluoride Poisoning. *J.A.M.A.* 117:1938 (Dec. 6) 1941.

58. McClure, F. J., Fluoride Domestic Waters and Systemic Effects. Relation to Bone-fracture Experience, Height, and Weight of High School Boys and Young Selectees of the Armed Forces of the United States. *Pub. Health Rep.* 59:1543 (Dec. 1) 1944.

Table 2.—Minimum dosage of fluorine to produce various effects in animals

Effect	Dosage	Species
Growth retardation[61]	20 mg./kg./day	Rat
Growth retardation[62]	313 ppm.	Rat
Growth retardation[63]	2-3 mg./kg./day	Cow
Reduction in birth weight[61]	190 ppm.	Rat
Milk yield decrease[63]	2-3 mg./kg./day	Cow
Survival to weaning[64]	226 ppm.	Rat
Calcium retention decreased[62]	623 ppm.	Rat
Calcium balance unchanged[65]	CaF_2 4-6 mg./kg./day	Pig
Bleached incisors[64]	14 ppm. (added)	Rat
Striations of incisors[28]	4 ppm. in water	Rat
Mottled enamel[41, 42]	1 ppm. in water	Human

ing physical examinations at United States armed forces induction centers. The bone fractures were classified as (a) arm, wrist or elbow (b) collar bone (c) leg, knee or ankle (d) nose and (e) other. He concluded:

> There was no relation of fracture experience to fluoride exposure. The average height and body weight of all the boys compared favorably with other height-weight data and accepted standards. The height-weight data were not related to fluoride exposures. . . .
>
> While these data on bone-fracture experience for both men and boys of these ages do not permit final conclusions, they do suggest strongly that no serious impairment in skeletal performance, as might be manifest in number of broken bones, seems related to exposure to fluoride domestic waters of the concentrations studied in this survey.

Texas men exposed to highest water-fluorine concentrations and Oklahoma men averaged 69.6 and 69.4 inches in height (weight 149.0 and 142.4 pounds), respectively. Men from rural Indiana and Indianapolis averaged 68.1 and 68.3 inches in height, 146.8 and 146.2 pounds in weight, respectively. Washington, D.C., men averaged 69.3 inches and weighed 151.2 pounds on the average. New Hampshire men were 67.3 inches tall and weighed 149.6 pounds on the average. These height-weight figures showed no relation to fluoride exposure.

Thyroid Metabolism.—Evans and Phillips[59] reviewed the evidence of fluorine as influencing the course of hyperthyroidism. They analyzed thyroids of forty thyroidectomy cases for fluorine and iodine and compared the findings with the basal metabolic rates. They concluded: "The data obtained gave no definite evidence that fluorine in any way played a part in human hyperthyroidism by its action on the thyroid gland."

Effect on Hearing.—There is some possibility that fluorine of water supplies may have beneficial effects on hearing. Lewy[60] found hearing defects in 4.9 per cent of 109,869 children from low fluoride districts in Illinois, and 2.8 per cent in 20,488 from districts with fluorine not over 1.4 ppm.

59. Evans, R. J.; Phillips, P. H., and Hart, E. B., Fluorine Storage in Cattle Bones. *J. Dairy Sc.* 21:81, 1938.

60. Lewy, A., Possible Value of Nontoxic Concentrations of Fluorine in Prevention of Deafness from Otosclerosis and Fibrosis. Its Possible Value in Prevention of Other Diseases. *Arch. Otolaryng.* 39:152 (Feb.) 1944.

61. Lamb, A. R.; Phillips, P. H.; Hart, E. B., and Bohstedt, G., Studies of Fluorine in Nutrition of Rat. I. Its Influence upon Growth. *Am. J. Physiol.* 106:550 (Nov.) 1933.

62. McClure, F. J., and Mitchell, H. H., Effect of Fluorine on Calcium Metabolism of Albino Rats and Composition of the Bones. *J. Biol. Chem.* 90:297 (Jan.) 1931.

63. Phillips, P. H.; Hart, E. B., and Bohstedt, G., Chronic Toxicosis in Dairy Cows due to Ingestion of Fluorine. *Agr. Expt. Sta. Univ. Wisconsin. Res. Bull. 123.* (Oct.) 1934, p. 1.

64. Smith, M. C., and Leverton, R. M., Toxic Effects of Fluorine Compounds on Teeth of Rats. *J. D. Res.* 13:249 (June) 1933.

65. McClure, F. J., and Mitchell, H. H., Effect of Calcium Fluoride and Phosphate Rock on Calcium Retention of Young Growing Pigs. *J. Agr. Res.* 42:563 (Mar. 15) 1931.

66. Ellis, G., and Maynard, L. A., Effect of Low Levels of Fluorine Intake on Bones and Teeth. *Proc. Soc. Exer. Biol. & Med.* 35:12 (Oct.) 1936.

Mottled Enamel: A Delicate Sign.—The appearance of mottled enamel appears to be the most delicate sign of chronic fluorine toxicity. In Table 2, some of the effects of minimum dosages of fluorine have been listed.

From the evidence available at present, a sample of which has been presented in Table 2, it appears that mottled enamel is the most delicate known effect of fluorides. As far as is known, there is no other toxic effect from ingesting amounts of fluoride as small as those taken when the drinking water contains 1 ppm. fluorine.

Local Actions

Fluorides applied locally in high concentrations may have deleterious effects of importance to dentistry.

Topical Applications of Fluorides.—Abelson[67] reported a case of dermatitis affecting the first two fingers and thumb of a dentist who had been using sodium fluoride for topical applications for six months. The attacks had occurred at the start of the applications but an attack resulting in blisters had occurred about three weeks prior to Abelson's observation of the case. A patch test with sodium fluoride gave "a late but plus 4 positive reaction."

Considering the small amounts of sodium fluoride actually used in recommended topical application procedures—about 1 cc. of 2 per cent solution or about 10 mg. of fluorine—there is no danger of any toxic sequelae. Consequently no precautionary measures are indicated such as a follow-up with calcium chloride solution or other calcium salts as used by Brady.[68]

Possible Pulp Injury in Desensitizing Dentin.—Barker[69] used Lukomsky's[70] paste in cavities and found it resulted in a large pulp abscess, fibrosis of the pulp, destruction of odontoblasts and thickening of blood vessels. Hoyt and Bibby,[71] following Lukomsky,[72] found that when a 33 per cent sodium fluoride paste was used in cavity preparation it caused intense pain on contact with freshly exposed dentin.

Lefkowitz and Bodecker[73] showed that crystals of sodium fluoride placed in artificial cavities in human teeth caused pulp abscesses and hyperemia. They indicated more severe effects in human teeth.

Rovelstad[74,75] included sodium fluoride in various ways in cavities prepared in children's teeth. These teeth were then extracted, for orthodontic reasons, (a) immediately, (b) 18 hours and (c) one week after application. "All of the teeth to which the drug was applied evidenced some pulpal reaction, with the exception of those removed immediately after the drug application."

Injections of Concentrated Solutions of Sodium Fluoride for Pyorrhea.—The ease of removal of tightly adherent masses of tartar from extracted teeth by aqueous solutions of hydrofluoric acid led Head[76] to apply a less injurious fluoride solution to the exposed portions of teeth in patients suffering from pyorrhea. He de-

67. Abelson, J. H., Case of Hypersensitivity to Sodium Fluoride in a Dentist. *Chicago Dental Soc. Fortnightly Rev.* 16: (No. 8) 6, (Oct. 15) 1948.

68. Brady, E. P., Dental Caries and Topically Applied Fluorides. *J. Missouri State Dental Assoc.* 28:139 (Apr.) 1948.

69. Barker, J. N., Reactions of the Pulp to Various Filling Materials. *Austral. J. Den.* 46:226 (Dec.) 1942.

70. Lukomsky, I., A New Dentine Desensitizer. *Dental Outlook* 24:537 (Dec.) 1937.

71. Hoyt, W. H., and Bibby, B. G., Use of Sodium Fluoride for Desensitizing Dentin. *J.A.D.A.* 30:1370 (Sept.) 1943.

72. Lukomsky, E. H., Fluorine Therapy for Exposed Dentin and Alveolar Atrophy. *J. D. Res.* 20:649 (Dec.) 1941.

73. Lefkowitz, W., and Bodecker, C. F., Sodium Fluoride; Its Effect on the Dental Pulp. *Ann. Dentistry* 3:141 (Mar.) 1945.

74. Rovelstad, G. H., Condition of Young Dental Pulp after Application of Sodium Fluoride to Dentin. *Northwestern Univ. Bull.* 48:6 (Nov. 17) 1947.

75. Rovelstad, G. H., and St. John, W. E., Condition of Young Dental Pulp After Application of Sodium Fluoride to Freshly Cut Dentin. *J.A.D.A.* 39:671 (Dec.) 1949.

76. Head, J., Treatment of Loose Teeth Due to Inflammatory Degeneration of Gums and Alveolar Process. *J.A.M.A.* 61:2232 (Dec. 20) 1913.

scribed the preparation of a 23 per cent solution of ammonium bifluoride in water and the beneficial effects when this solution was "injected once or twice a week in pockets around loose teeth." No systemic or local injury was noted although Head warned that "care must be taken not to inject it into fresh cuts, as such procedure will cause great pain." No other reports of this use of fluoride solution appeared until Lukomsky[73] recommended a similar use of sodium fluoride.

Summary

1. The possible hazards attendant on the use of fluorides in dentistry have been discussed. The most important applications of fluoride at present are (a) fluoridization of water, (b) topical use of concentrated solutions, and (c) fluoride paste used to desensitize dentin. Other uses of fluoride are cited that are, at present, not therapeutically important.

2. Two per cent solutions of sodium fluoride as used for topical applications are perfectly safe when the application is made in the dental office. The two per cent solution is too toxic to be kept in homes and should never be prescribed.

3. Chronic, crippling fluorosis will never appear as a result of dental uses of fluorides.

4. Mottled enamel, the most delicate sign of fluoride toxicity, will be found when fluoridization is carried out at about 1 ppm. of fluoride only in a very few individuals in whom very mild mottling will occur. No unesthetic marring of the teeth should occur.

5. Persons drinking communal water supplies containing about 1 ppm. fluorine conceivably might increase the fluoride intake by daily accessory fluoride administration to a level sufficient to cause mottled enamel.

6. There is no other known toxic effect of drinking water containing 1 ppm. fluorine than the "very mild" mottling of the teeth.

7. Repeated local applications of fluorides on soft tissues, for example, the skin of the fingers, has produced dermatitis in a single recorded case.

8. Concentrated preparations of sodium fluoride have been shown to produce pulpal reactions when applied to freshly cut dentin for desensitization.

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Antiques Under Hats.—It is interesting to compare attitudes in the physical and the social sciences. We take pride in the newest and most modern gadget or technic. We are disturbed if the doctor evidences the slightest suggestion that he is "behind the times," since this may mean needless suffering. But in social matters we are equally proud of beliefs which were current when diseases were treated by boring holes in the head. Barnes puts it picturesquely when he says, "The only place we prize antiques more than in our living rooms is under our hats."—*Bruce Stewart, "Challenge to Social Science." Science 110:181, August 19, 1949.*

THE CARE OF THE DENTIST'S HANDS

Elmer R. Gross, M.D., Philadelphia

THE dentist's hands are his greatest asset. Yet there is nothing to be found in the literature wherein physicians have spoken to their dental colleagues on the care of their hands.

Dentists as a group have become such slaves to a habit that they have unconsciously developed what might be termed the "automatic wash reflex." To the observer it appears that the dentist washes his hands after every systematized procedure he performs, varying his method from scrubbing with soap and water to merely washing them with soap and water without a brush. One might well marvel that the dentist's hands do not resemble those of a scrubwoman.

Noxious Agents

The following classification encompasses the noxae that dentists frequently encounter: (1) Defatting substances, (2) sensitizers, (3) mechanical agents, (4) physical agents, (5) biologic agents.

Defatting Substances.—Normally the pH of the skin is on the acid side.[1] This is known to the dermatologist as the protective acid mantle of the skin. Soap, which is a mixture of a fatty acid and an alkali, requires alkalinity for its cleansing effect. The soaps on the market vary, of course, in their fillers, pH, and other factors. However, after the hands have been washed with soap and water, the pH of the skin automatically becomes alkaline and does not return to normal acidity for several hours. In the meantime, if the hands are again washed several times, the pH of the skin remains alkaline and, when this procedure is repeated countless times daily, the normal protective acid mantle of the skin is changed to an alkaline mantle which may precipitate an eczematous reaction.

Furthermore, since soaps are defatting agents, their continuous injudicious use predisposes to eczematous changes of the skin.

Another common defatting agent is encountered in laboratories in the developing of dental films. Many dental practitioners immerse their fingers, if not their hands, in developing solution, instead of using forceps or a plate holder; or, without waiting for the plates to dry, pick up a wet plate holder which drops solution all over their hands and leaves its telltale mark.

The following outline of treatment is recommended.

1. Do not wash your hands twenty to thirty times a day. It is not necessary. Physiologically, the mouth is always septic; therefore it is not heresy to state that this asepsis is of no avail. Do not work with dirty hands, but do achieve a happy medium.

2. Use a superfatted soap; there are many on the market. If you wish, use a soap substitute, but it has been the experience of some that soap substitutes

Read before the monthly meeting of the Delaware State Dental Society, Wilmington, Delaware, October 20, 1949.

Assistant Professor of Dermatology and Syphilology, Temple University Medical School.

1. Klauder, J. V.; Gross, E. R., and Brown, H., Prevention of Industrial Dermatitis. *Arch. Dermat. & Syph.* 41:351 (Feb.) 1940.

secondarily appear to dry the skin.

3. As a substitute for washing your hands too frequently, have your nurse make up a saturated solution of boric acid, equivalent to one tablespoon of boric acid powder to a quart of tap water. One tablespoon of sodium hexametaphosphate may also be added. It will serve as a water softener and will tend to give the hands a velvety feeling. This solution may be kept in a basin at a convenient location so that you can immerse yours hands whenever necessary. The solution should be replenished daily.

4. If you must wash your hands with a soap frequently, after washing anoint them with a vanishing type cream, preferably a buffered lactic acid cream with a pH of 5.5. Apply a small amount of the cream, employing a hand washing technic, and wipe off any excess with a tissue.

5. Avoid the common pitfalls of too frequent contact with developing solution, cold sterilizing solutions, antiseptics which contain alcohol and other defatting agents, such as gasoline, turpentine, paint, photographic solutions, glue, and so forth, which the dentist may encounter extracurricularly in his hobbies.

Sensitizers.—Hypersensitivity to local anesthetics is common among dentists. Laden and Wallace[2] subjected ten dentists, all of whom suffered from chronic dermatitis involving the hands, to clinical and allergic studies. They found that nine of them reacted to local anesthetics with eczematous reactions. The clinical picture was striking in uniformity of distribution and skin changes. The distal phalanges of the first three fingers of the left hand were the principal sites of involvement, which coincides with the technic of inserting these fingers into the patient's mouth during infiltration of the anesthetic. Contact often occurs by leakage of the material from the syringe.

The practice of rubbing topical pastes containing Butyn and other sensitizers on the palm is conducive to the production of a dermatitis.

Paronychia is a common finding in dentists. Laden and Wallace[2] also state:

> Hypersensitivity to one of the members of the procaine group, a para-aminobenzoic acid ester, usually leads to hypersensitivity to all of the group. Namely procaine, Larocaine, Tutocaine, Monocaine, Butyn and Pontocaine.

It is suggested that dentists who are sensitive to the procaine group adopt substitute local anesthetics such as Metycaine, Intracaine, and others differing from the procaine group.

Mercury is a common offender. If sensitivity can be proved by a positive patch test, it is a simple procedure to eliminate mercurial antiseptics and substitute others such as aqueous solution of benzalkonium (Zephiran) chloride. Mercury in amalgam fillings is a source of dermatitis. Formaldehyde, phenol, cresol, thymol, Butyn, epinephrine, methyl alcohol and sterilizing solutions have produced lesions among dentists.

Plastic agents contain resins which are sensitizers. Penicillin and sulfonamides also are capable of producing sensitivity.

Physical Agents.—Because radiodermatitis may result from the incautious use of roentgen rays, a good roentgenologic technic should be developed. Do not hold the unexposed film in the patient's mouth. It may appear to be a harmless practice, but constant exposure will eventuate in a radiodermatitis with its consequent serious sequelae such as squamous cell epithelioma.

Mechanical Agents.—Too frequent use of the scrubbing brush on the hands abrades the skin and removes the protective keratin layer. The hands should be gently and deftly washed with the palms. The dentist

2. Laden, E. L., and Wallace, D. A., Contact Dermatitis Due to Procaine. *J. Invest. Dermat.* 12:299 (May) 1949.

should be brush-conscious only in teaching his patients dental hygiene.

The palms and fingers should not be employed as a mortar and pestle. Besides being more effective, the newer devices save wear and tear on the hands.

Biologic Agents.—Syphilis may be transmitted during the course of dental work when open lesions are present in the patient's mouth. The dentist should learn to recognize a chancre, and to suspect any unusual lesions in the mouth. Chancres of the finger tips of dentists, acquired from this source, have been observed.

Tuberculosis also is sometimes contracted from patients. Such infection would be a primary inoculation type of tuberculosis.

The human bite is more dangerous that the bite of a dog. Two cases of human bites in dentists have come under the care of the author and, despite penicillin and sulfonamides, both patients had a stormy course.—*1402 Spruce Street.*

▲

Correlation of Barbiturate Level with State of Consciousness.—Preliminary studies of the concentration of pentothal in the blood during surgical anesthesia show that consciousness is lost at about 1.0 mg. per 100 cc., whereas second-plane anesthesia is reached at 2.0 to about 3.0 mg. per 100 cc.

The short-acting barbiturates, seconal, amytal and pentobarbital, cause coma when the blood level is between 1.0 and 3.2 mg. per 100 cc. Consciousness is lost at slightly lower levels when larger doses are ingested—that is, with rapidly rising drug concentrations in the blood. Another important modifying factor is the state of reflex excitability of the central nervous system; a given blood concentration is less depressing in agitated patients or those stimulated by benzedrine or caffeine.

The long-acting barbiturates, barbital and phenobarbital, are much less potent than those mentioned above. Several conscious patients, some of whom were ambulatory, were found to have blood levels as high as 5.0 to 7.5 mg. per 100 cc. Two patients with blood phenobarbital levels of 7.2 and 6.8 mg. per 100 cc. were described clinically as semicomatose. The minimum blood barbiturate concentrations accompanied by coma in 7 patients who recovered from barbital or phenobarbital poisoning were in the range 7.0 to 12.0 mg. per 100 cc.—*Notes from the Medical Examiner, "Barbiturate Toxicity," The New England J. Med. 240:395, Mar. 10, 1949.*

CASES AND COMMENTS

Three Layers of Teeth: Report of a Case.

By Nathan Kaplan, D.D.S., Brooklyn, N.Y.

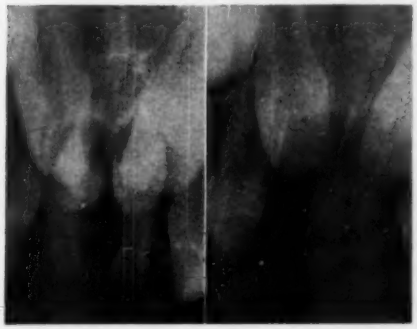
Although supernumerary teeth have been found and reported in the literature, their occurrence so that three levels of teeth are present is rare.

An 8-year-old white boy was brought to this office for the removal, under nitrous oxide of the deciduous central incisors.

Roentgenographic examination of the central incisor region revealed, in addition to the deciduous central incisors, two supernumerary tooth buds lying just below the permanent central incisors as shown in the illustration (left). Thus there were three horizontal strata of teeth.

Under nitrous oxide anesthesia, the deciduous teeth were easily removed. However, no trace of the buds could be seen through the sockets. A V-shaped incision, immediately mesial to each of the permanent lateral incisors, was made, and the two incisions connected by a lateral incision across the crest of the ridge. The flap of tissue was raised and the bone exposed. The labial plate of bone was removed with rongeurs, but still no buds were exposed. However, after the socket opening had been enlarged with a round bone bur, one bud was revealed lying lingual to the crown of the permanent central incisor. It was exposed further with bone burs and removed. The other bud was found lingual to the other central incisor and removed in a similar manner. A postoperative roentgenogram is shown in the illustration (right).

Recovery was uneventful and the sutures were removed after four days.—1031 *Gates Avenue*.



Left: In addition to deciduous central incisors, two supernumerary tooth buds just below the permanent central incisors can be seen. Right: After removal of deciduous central incisors and supernumerary tooth buds

A Simple and Rapid Technic for Restoring the Fractured Young Incisor.

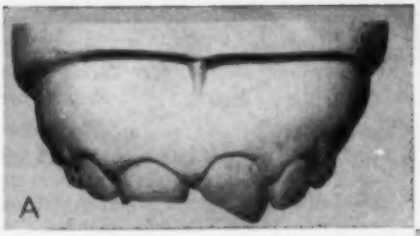
By Louis B. Kelsten, D.D.S., Newark, N.J.

In this report is described a quick, simple procedure for restoring anatomic form, after treatment, of a child's fractured incisor. The technic protects the tooth and gives it a pleasing appearance until the patient is mature enough for a porcelain jacket to be prepared.

The problem is illustrated (A) by a cast from the mouth of a patient with two fractured upper central incisors taken before treatment.

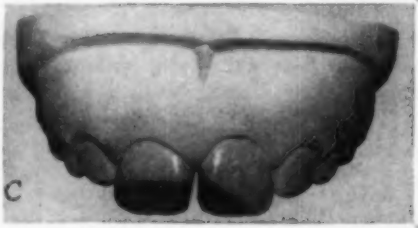
After the treatment necessary for the particular case—pulp capping or pulpotomy, or merely a base of zinc oxide and eugenol paste—the proximal surfaces of the incisors are disked with a diamond instrument (B). Crystal-clear acrylic crown forms are then selected, and trimmed at the gingivae with curved scissors in order to seat them properly on the fractured teeth (C).

After preparation, the teeth are isolated with cotton rolls; sterilized with phenol, taking care not to disturb the previous medicament; dried with a pledget of cotton, and varnished. The proper shade of a self-curing resin (methyl methacrylate) is selected. In mixing, liquid (monomer) sufficient to fill both crown forms is poured into a small, clean, porcelain jar and a small quantity of powder (polymer) is sifted into the jar until the mixture begins to turn dry and sandlike, when the surplus powder can be poured back into its original container. This procedure assures proper propor-

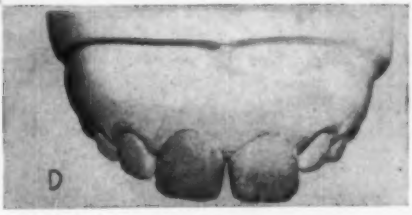


Four stages in the restoration of two fractured young incisors to anatomic form. A: Cast of mouth before treatment

B: After treatment of the teeth, proximal surfaces are disked with diamond instrument



C:Crystal-clear acrylic crown forms, trimmed at the gingivae to fit, seated over tooth



D: Finished jackets have restored anatomic form to the fractured incisors

tions of powder and liquid, is simple and prevents waste of material. The material is mixed with a noncorrosive spatula for about 30 seconds, until it appears soft and plastic.

With a plastic instrument, the soft mix is placed into the prepared crown forms, which are then seated over the fractured teeth.[1]

Polymerization of the material, resulting in its uniting perfectly with the acrylic crown form, usually occurs in about 15 minutes, after which the excess material can be removed with a cylindrical stone. If the lower teeth strike the lingual surface of the jacket, the situation can be corrected by stoning. Since the jacket is only a temporary restoration, cutting completely through the lingual surface is permissible if it is necessary. The stoned area is polished first with a water paste of pumice and then with whiting. The finished jacket is shown in illustration (D). Later, if the child loosens a jacket, the latter can be cemented into place with ordinary cement.

This technic is rapid, simple and economical. In addition to protecting the tooth, it lends an esthetic quality which pleases both parent and child.—*427 Lyons Avenue.*

1. Sufficient density of form is produced by the pressure of crown forms against the teeth. The procedure of allowing the material to stand for three or four minutes in the covered jar, which is recommended for other types of restorations, produces a heavy, rubbery mass which may distort the crown forms while they are being seated on the teeth.

The Amalgam-Bar Space Maintainer.

By Maury Massler, D.D.S., M.S., and John M. Frankel, D.D.S., Graduate Pedodontics Division, University of Illinois College of Dentistry.

There exists a need for a simple and inexpensive space maintainer that can be easily and quickly constructed by the busy general practitioner to replace first or second primary molars which are lost prematurely. In 1944 Wesoke[1] described a simple amalgam-bar type of space maintainer to serve this very need. This appliance never received the wide acceptance or attention that it deserves, probably because few general practitioners are aware of its existence, its usefulness and its simplicity. While there are many more elaborate types of space maintainers which are perhaps more efficient, these in general require some special skill (in pinch-band formation, accurate free hand soldering technic, precision casting technic, and so forth). The construction of the amalgam-bar space maintainer requires no special apparatus, technics or skills. In addition, it can be constructed very quickly.

When indicated, the amalgam-bar space maintainer is an excellent replacement for first or second primary molars, serving all of the functions of a space maintainer admirably. It is a practical restoration which conserves both time and materials and gives good service. No laboratory work is required.

Indications and Advantages.—The amalgam-bar space maintainer is indicated where there has been early loss of an upper or lower first or second primary molar. If used to replace the second primary molar, the first permanent molar must, of course, be erupted and require restoration of its mesial surface.

The use of the amalgam-bar space maintainer is limited to situations in which proximal amalgam restorations are indicated on either side of the edentulous area. Unless decay is present on the proximal surfaces, it is better to use another type of space maintainer such as a band-loop or Willett's type.[2]

The amalgam-bar space maintainer has the disadvantage, inherent in any amalgam restoration, of being subject to occasional fracture of the marginal ridge under excessive stresses. However, repair of the space maintainer is very simple.

Materials and Technic.—A piece of 18-gage stainless steel round wire or the equivalent is required, approximately ½ to 1 inch in length, as well as amalgam for the restorations.

1. Place the usual type of proximal-occlusal amalgam restoration in the teeth adjacent to the edentulous area.
2. During the next visit, polish the proximal surfaces and cut grooves on the proximal surface of each restoration (Fig. 1, B). Carry the grooves from the occlusal surface down to and below the contact areas so that the bar will rest at the contact areas. Make the grooves large enough to accommodate the piece of 18-gage stainless steel wire loosely, but do not expose the dentin of the axial wall. Undercut the grooves for retention of the new amalgam.
3. Cut a piece of 18-gauge stainless steel round wire long enough to fit snugly between the two grooves.
4. Notch the distal end for retention in the amalgam if desired and place a rounded point on the opposite end which will be semifixed (Fig. 1, A). Both ends may be rounded and made semifixed if the occlusion is forceful.
5. Place two coats of cavity varnish or shellac on the pointed end (or ends) of the wire to prevent cohesion with the amalgam. When the restoration has been in the mouth some time, the varnish or shellac will dissolve leaving the wire semifixed.
6. Place the bar in the grooves prepared for it and pack amalgam around the bar. Carve the amalgam to proper contour (Fig. 1, C and D).
7. The amalgam restorations are polished at a subsequent sitting.

Comment

The original description of the amalgam-bar space maintainer by Wesoke in 1944 placed the bar near the gingival floor of the preparation. It was found that the restoration was just as strong if the bar was placed at the contact area and was, in addition, self-cleansing and more hygienic. In this position, too, the bar

1. Wesoke, Philip, A Simple and Effective Space Maintainer. *J. Den. Children.* 11:48, 1944.
2. Willett, R. C., Premature Loss of Deciduous Teeth. *Angle Orthodont.* 3:106 (Apr.) 1933.

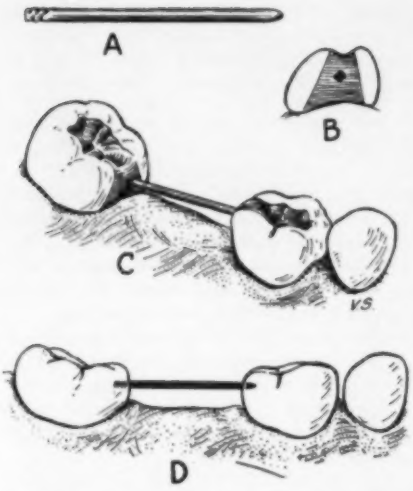


Fig. 1.—A, 18-gage stainless steel wire, with rounded end, and B, groove cut on proximal surface to receive it. In C and D, bar is in the grooves and amalgam has been packed around it and carved to proper contour

could serve as an occlusal antagonist to resist excessive supra-eruption of the opposing teeth. Wesoke suggested that both ends of the bar be made semifixed. We have found that it is often desirable to have one fixed and one semifixed joint.

If one of the anchor teeth is exfoliated or it is necessary to remove the bar at the termination of its usefulness, it is simple to cut the bar through the middle with a disk and remove the two pieces. The amalgam restorations can then easily be repaired with fresh amalgam.

While both silver and stainless steel are utilized in the construction of this space maintainer, there is little danger of galvanism as the close approximation of the two metals dissipates the electromotive force within 24 to 48 hours.[3]

Summary

There is a need for a simple and inexpensive space maintainer to replace missing first and second primary molars. The amalgam-bar space maintainer described by Wesoke in 1944 is a simple, inexpensive device that serves this purpose very well in the hands of the general practitioner who deals with children.

The technic for the construction of an amalgam-bar space maintainer is presented.—*808 South Wood Street.*

3. Reed, G. J. and Wilman, M. Galvanism in the Oral Cavity. *J.A.D.A.* 27:1471 (Sept.) 1940.

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Stream of Knowledge.—The stream of knowledge is no man-made canal but rather a brook whose long quiet pools are divided by rapid and sparkling stickles. So it is that methods of instruction in medicine pass from teacher to teacher with no change beyond some new facts, some new textbooks, and sometimes a new illustration. Change, when it comes, springs from one man who risks both the conservatism of students and the wrath of examiners. Mall raised anatomy from a slut in a charnel house and married her to physiology; and the nest of fledglings fostered by Elliot Smith in Gower Street has perpetuated her respectability. One dictum by Virchow changed the teaching of pathology throughout the world—not entirely, perhaps, to its ultimate benefit. It was the principles rather than the practice of medicine which led Osler to write the wisest of all textbooks. These are signal names, and they would be more numerous were it not for the common and proper caution in experiment at the expense of others.—*"The New Bacteriology," The Lancet 57:375, August 27, 1949.*

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EDITORIALS

BUREAU OF ECONOMIC RESEARCH AND STATISTICS UNDERTAKES STUDY OF DENTAL PRACTICE

THE urgent need for accurate information on the present status of dental practice has led the Bureau of Economic Research and Statistics to undertake a nation-wide survey.[1] Early in April the Bureau will mail questionnaires to one-fourth of the dentists in the United States requesting information on most of the important factors that enter into the practice of dentistry. This is the most comprehensive survey of dental economics ever undertaken by the Association and its success will depend on the thoroughness with which members fill out and return the forms. The questionnaires need not be signed as the Bureau is not interested in, nor will it release, any information furnished by an individual dentist.

In recent years certain government officials and other proponents of compulsory health insurance have flooded the country with half truths and misinformation regarding the general and dental health of the nation. Much of the propaganda was, and still is, based on their interpretation of data obtained from ill-conceived and poorly executed studies made by persons unfamiliar with medicine or dentistry. Members are urged to cooperate in the current survey in order to provide the public and the profession with accurate information which can be used to combat the misinformation issued by advocates of federal health insurance. Data obtained from the study will be used also by the Association to blueprint and promote the development of sound community dental health programs, as experience has proved that such programs come nearer to meeting the desires of the American people and provide the most effective and economic method of improving standards of dental health.

1. See page 468, this issue.

DENTISTS ASKED TO AID IN EASTER SEAL CAMPAIGN FOR CRIPPLED CHILDREN

In the United States today there are eight million children who suffer from any one of a number of crippling handicaps which make them different from their friends and playmates. A few years ago they would have lived out their lives behind the windows of their homes, shut off from normal living and from the hope for a happy, independent future. Today, as the result of a great organization dedicated to service, research and public education on their behalf, they can hope to be happy, self-sustaining adults.

The National Society for Crippled Children and Adults and its 2,000 affiliated societies in all parts of the United States, Hawaii and Alaska, are engaged in a year-round, nationwide program to seek out these children and provide them with the services of clinics, special classes and schools, health camps, and medical and vocational specialists, in order to help them overcome their handicaps.

Dentists can participate in this great work through the means of the annual Easter Seal Drive, held nationwide to raise funds to carry on these activities. Dentists, members of a profession which has long recognized the need for giving services to those least able to afford them, will want to support the Easter Seal Drive through contribution of funds and effort.

BUREAU OF CHEMISTRY ANNOUNCES OPENINGS FOR TWO RESEARCH ASSISTANTSHIPS

The approval by the Board of Trustees, last February, of a recommendation to establish two research assistantships[1] in the Bureau of Chemistry marks another important step in the Association's efforts to stimulate research and improve its services to the public and the profession. The training program, financed jointly by the American College of Dentists and the Association, provides an opportunity for promising young chemists to establish a career for themselves in the field of dental research.

Selectees for the assistantships will be chosen from recent graduates of chemistry who ranked in the upper 25 per cent of their class. The successful candidates will be given an opportunity to obtain practical experience on a part-time basis in the Bureau of Chemistry and in addition they will be granted a stipend which will enable

1. See page 468, this issue.

them to further their education in one of the universities in the Chicago area. By working in the Central Office of the Association, appointees will have the added advantage of obtaining a thorough understanding of the many problems and activities of the profession. This experience will provide them with a broad concept of dentistry which, in addition to their academic and practical training, should fit them well for a teaching or research position in one of the dental schools or in some other institution interested in research.

The assistantship plan is a concrete example of what may be accomplished through cooperation. Both the Association and the American College of Dentists working independently in the past have sponsored a number of research projects. By pooling their resources they now have launched a program which has unlimited potentials. The project brings the professions of chemistry and dentistry closer together, it helps overcome the difficulty which the profession has experienced in attracting research workers to the problems of dentistry, it opens up a new and attractive means of livelihood to capable chemists and it demonstrates that private agencies, on their own initiative and unfettered by government control, will continue to develop ways and means of improving the health of America.

ASSOCIATION LAUNCHES CAMPAIGN TO REPLACE DENTAL TEXTBOOKS IN WAR-TORN LIBRARIES

THE terrific toll levied by the war on the educational centers of Europe, Asia and the Philippines cannot be comprehended by those who have not witnessed the destruction. Few universities or libraries escaped unscathed and hundreds were completely demolished. Prague's Research Institute of Medical History lost 16,000 of its 20,000 volumes, the British Museum Library lost 250,000 volumes and the University Library of Louvain lost nearly 1,000,000. These terrible losses, multiplied a hundred times over in each of the war-torn countries, has placed almost insurmountable barriers in the path of teachers and students of dental and medical science. It is necessary that these barriers be lifted as quickly as possible by rehabilitating the devastated libraries in order to restore an international exchange of scientific knowledge which is so essential to world progress.

This month the Association launches a nationwide program[1] which will enable American dentists to contribute to that end. The program, recommended by the Council on International Relations and approved by the House of Delegates, consists of three parts: (1) Donation by the Association of literature to war-torn countries through the CARE book program of UNESCO; (2) establishment of procedures which will enable members to contribute funds to the CARE book program, and (3) approval of a program which will enable students in American professional schools to contribute funds for books, through UNESCO, to students in professional schools in devastated countries.

1. See page 469, this issue.

The first phase of the program and the third or students' phase of the plan are well under way. During 1949 the Association sent 77 sets of the Index to Dental Periodical Literature—a contribution of $11,500—to universities and libraries in 33 countries. More sets are being sent as rapidly as requests are approved.

The success of the second phase of the program will depend upon the understanding, generosity and cooperation of members. The goal for this fund-raising drive has been set at $250,000—about $3.50 per member, which is small in comparison to the need. All contributions received from members will be forwarded by the Association to CARE, UNESCO. CARE will purchase dental books at wholesale from a list of 50 standard books compiled by a professional committee. Each set of 50 books, constituting the nucleus of a dental library, will be forwarded to one of the devastated educational institutions. Members are urged to send their contributions to CARE Program, American Dental Association, 222 East Superior Street, Chicago.

INTERNATIONAL CORRESPONDENCE

NEWS FROM BRITAIN

A Local Executive Council Decision

A decision of considerable importance has been taken by a Local Executive Council in Scotland. A man consulted a dentist asking for treatment under the National Health Service. After the examination of the patient's mouth the dentist planned to extract all the upper teeth and to provide an upper denture. The patient was informed of this proposal and the estimate was posted to the Dental Estimates Board. The estimate was questioned by the Board and the opinion of the Regional Dental Officer (government dental referee) was requested.

Having examined the mouth the R.D.O. advised that fourteen fillings, one crown and periodontal treatment were, in his opinion, necessary. The dentist was then informed of the result of the R.D.O.'s examination and was prepared to accept his view but nevertheless wished to retire from the case. The dentist pointed out that he was very busy trying to overtake arrears of work, and that to undertake so many fillings would take up a lot of time especially when the patient could only come after 5 P.M., which was his busiest time.

Having had the request from the dentist to retire from the case the Local Executive Council wrote to the patient, who failed to reply to the letter by the time the L.E.C. met on February 6th. In the report of the discussion on this case several members of the L.E.C. stressed the importance of looking after the welfare of the patient. It was then asked whether the best interests of the patient were being considered if they refused the dentist permission to withdraw from the case and compelled him to perform treatment which he had no wish to undertake.

Another member pointed out that the matter had been very protracted (the patient originally sought treatment in September, 1949), and the sooner the patient got treatment the better. One of the dental members expressed the opinion that if fourteen fillings were required in the upper jaw the patient had thoroughly neglected his teeth, and he thought that the mouth must be in a pretty hopeless state and few patients in such circumstances will agree to have fillings done. He thought that the dentist's view that the teeth should be extracted was the right one and that the R.D.O.'s view was wrong. After the discussion the matter was put to vote and the dentist's request to be allowed to withdraw from the case was refused by a large majority.

Two questions are now being asked in dental circles. Where there is a difference of professional opinion is that of the government official (the R.D.O.) to be taken as the correct one? And is it tolerable that decisions relating to professional matters should be decided by a committee in which dentists are in the minority?

Caries Research

Since the end of the Second World War there has been a widespread interest focused on the caries problem. The histology of the enamel has been interesting Professor Manley of Birmingham. His serial sections of enamel demonstrated at the annual meeting of the B.D.A. last year attracted much attention. At the same meeting the work of Mr. J. J. Hodgson of the Sheffield Dental School, who has been able to find tubular organic defects in the enamel by careful micro-dissection, fascinated all who saw his beautiful preparations. Kesel's work is being

followed up by Dr. Neil Jenkins of the University of Durham who is also enquiring into the immunity factor in humans and dogs.

Sodium Fluoride Applications

In Britain we tend to think that in the United States not enough attention is given to the excellent work of Weaver on the subject of fluoride. Recently the London County Council has undertaken an investigation involving 1,500 school children and another scheme has just been launched by the Ministry of Education. This investigation will involve about 4,000 children and the work will be carried out in eleven centers in different parts of England. The object of the investigation is to test the effectiveness of the topical application of sodium fluoride in the prevention of dental caries. Knutson's method is the one to be used generally but four variations are to be tried out also.

The children for the experiment will be recruited from the Local Education Authority Schools in the area of each center. Every endeavor is being made to ensure a representative group of children and emphasis is being made on age and not the dental state of the patients. The children will be examined and their dental state will be charted and within a month the fluoride solution will be applied to the right and left quadrants of alternate children. It is hoped to extend the investigation over a number of years. The first recall will be in one year.

NEWS FROM SCANDINAVIA

Inter-Scandinavian

An important move was made by the deans of Scandinavian dental schools to promote inter-Scandinavian cooperation in dental education and research through the formation of the Council of Deans of Scandinavian Dental Colleges. This body also is interested in fostering closer contacts with dental schools abroad as well as with organizations representing such schools.

The council represents the dental faculty of the University of Helsinki, Finland (Dean Eero Tammisalo), the National Dental Colleges of Denmark, Copenhagen (Dean E. Husted), Stockholm, Sweden (Dean Gösta Westin), Malmo, Sweden (Dean Sven Sellman), and of Norway (Dean Ivar Krohn, Oslo). The president of the council is Dr. Husted, while the secretary is P. O. Pedersen, associate dean of the National Dental College of Denmark.

Denmark

As of September 1, 1949 new regulations have been established for admission of students to the National Dental College of Denmark. The dental curriculum of four years is preceded by an additional year of predental training during which both basic and manual subjects are taught. Under the new regulations admission to the Dental College will be granted on the basis of proficiency in basic sciences, but additional consideration will be given to manual ability. The capacity of the Dental College being 100 students per class, the selection of students for admission in the September 1950 class will have to be made from the much greater number now enrolled in the preparatory course.

During 1949 Danish State support of studies by Danish dentists abroad has considerably increased. Medical and dental research is in part supported by foundations like King Christian X's Foundation and P. Carl Petersen's Foundation. Grants from private or commercial sources are negligible.

Funds made available for dental research by the Danish Dental Association will total the equivalent of $3,000 in 1950 as compared to an annual of $575 previously. The House of Delegates of the Danish Dental Association at their annual meeting in Copenhagen on November 13, 1949, voted this additional grant, which represents $1.40 per member of

the Association. Almost all Danish dentists are members of the D.D.A. Its membership is 1,750. The grant made by the D.D.A. will support at least as much domestic research as will $6,000 in the United States.

Dr. Aage Riis-Petersen was re-elected President of the Danish Dental Association. Dr. P. O. Pedersen was re-elected President of the Danish Odontological Society.

Finland

Eight hundred Scandinavian dentists attended the 29th Congress of the Scandinavian Dental Association in Helsinki, Finland early in August, 1949. The President of Finland, Mr. Paasikivi, was present at the first plenary session when the President of the Scandinavian Dental Association, Dr. Juuso Kivimäki, delivered his opening address. Dr. Gösta Lindblom of Stockholm, Sweden, was the first of a series of essayists on balanced occlusion. The congress had a very full program with most papers pertaining to balanced occlusion and related subjects. The Finnish dentists were excellent hosts and were given much well deserved credit for their organization of both scientific and social events. The next congress of the eighty-three year old Interscandinavian Association will be held in Norway in 1952.

Sweden

Among academic events in Sweden the yearly presentation of advanced degrees to doctors from all faculties has always been a highlight. This event, originating from ancient times and celebrated with much solemnity, takes place every year in May in the monumental City Hall of Stockholm. In 1949, for the first time, the Royal Dental College of Stockholm participated on equal footing with the other professional colleges.

During past years a number of Swedish dentists had fulfilled the rigid requirements for an advanced degree in dental science, but regulations had prevented them from using the title of doctor. By Royal rescript the Dental Colleges of Stockholm and Malmö have now been permitted to award the degree of doctor of odontology (Dr. odont.) for outstanding research in dentistry and related fields. The Dean of the Royal Dental College of Stockholm, Dr. Gösta Westin, presented 19 degrees of doctor of odontology. Six of them were honorary.

The new Dental College in Malmö, Southwest Sweden, is not yet widely known abroad although it is one of the finest and best equipped dental schools of the present time. The planning and construction of this school is an achievement for which Swedish State and academic authorities deserve much credit. To European dentistry this new place of learning will undoubtedly prove to be an asset of no small importance.

On September 10, 1949 the Swedish Crown Prince and a large number of high Swedish and foreign officials and guests were present at the opening ceremony of the new Dental College. Addresses were delivered by the Crown Prince and the temporary dean of the College, Dr. Gösta Glimstedt, professor of anatomy at the nearby University of Lund. There was an official dinner at the City Hall of Malmö after the opening ceremony.

So far three professors have had definite appointments at the new dental school. They are Dr. Sven Sellman (operative dentistry), Dr. Hilding Björn (oral surgery), and Dr. Carl M. Seipel (orthodontics). Dr. Sellman is now dean of the College.

In Sweden the two principal dental organizations are the Swedish Dental Society, which deals with lecture programs and postgraduate education and the Swedish Dental Association, which deals with professional ethics, business matters and public relations. Dr. Yngve Hildebrand, professor of prosthodontia at the Royal Dental College of Stockholm, is the president of the Society. Dr. Erik Nilson of Malmö was recently elected president of the Association for a period of three years.

THE NATIONAL SCENE

from The Journal's Washington Correspondent

More than 40 Veterans Administration facilities throughout the country where out-patient dental care is given are being abolished this spring as a result of the March directive by Administrator Carl Gray ordering a reduction in force of approximately 7,800 positions, of which nearly 4,900 are in the Department of Medicine and Surgery. This means that an even greater percentage of dental examinations and treatment of VA beneficiaries will be handled by private practitioners on a fee basis. An estimated 90 to 95 dental positions have been eliminated by the economy order. Dr. Bion R. East, chief of VA dental services, reported that the backlog of applications for dental care is rising steadily.

Federal Aid to Schools

Delay in completion by the House of action on legislation for federal aid to medical, dental and nursing schools is responsible not only for holding up other pending health bills but also for putting off public hearings on the question of national health insurance, both compulsory and voluntary. In February and March, the House subcommittee on medical and dental affairs held many executive sessions in an endeavor to resolve controversial aspects of the education-aid bill (H.R. 5940). When that measure is finally disposed of by the parent Committee on Interstate and Foreign Commerce, the subcommittee will turn its attention to scheduling of hearings on the Javits-Herter, Bosone and Thomas-Murray-Dingell insurance bills.

Some interesting sidelights on efforts exerted by government agencies, as well as private organizations, to achieve (or defeat) national health insurance are expected to emerge from the public hearings, which were to be opened March 27 by the House Lobbying Committee and continue for an indefinite period. A fortnight before launching of this investigation, which is almost certain to bring about revision and tightening up of the federal lobbying statute, the special investigating committee was still undecided as to which specific phases of the problem would be considered. It is regarded as inevitable, however, that the pro- and anti-health insurance lobbies would figure early and importantly in the hearings.

Civil Defense

Quite different in character, but concerning a subject likewise of major import to the dental profession, are the hearings on civil defense planning conducted by the Joint Congressional Committee on Atomic Energy. Long delayed, partly because of conflicting opinion over the wisdom of airing home defense problems in public, the hearings will reveal for the first time, in the open, what has been done to prevent or reduce loss of life in event of atomic explosion and what remains to be done.

Service Hospitals Close

Still another series of hearings launched in March dealt with the closing of five Army and Navy general hospitals by Secretary of Defense Louis Johnson and the reduction in status of 13 others. The military dental departments were not

primarily concerned with this development, but the Army's in particular, awaited the investigation's outcome. The reason was that Representative L. Mendel Rivers (D., S. C.), chairman of the hospital inquiry, is the sponsor of pending legislation which would give the Army dental department a higher degree of independence, comparable to that of the Navy. Further hearings on this bill were delayed pending the return to Washington late in March of Rep. Rivers and members of his special subcommittee from a two-week field inspection of hospitals affected by Secretary Johnson's order.

Dental Research Building

Whether the U. S. Public Health Service budget for the next fiscal year, which begins on July 1, will include funds to start construction of a building to house the National Institute of Dental Research is still in doubt. The American Dental Association is spearheading efforts to have as much as possible of the $2,000,000 authorized for this project appropriated in the 1950-51 budget.

The Budget Bureau, which has withheld approval of the appropriation, declined to comment on charges made in New York City on March 9 by Harold Hillenbrand that its refusal to recommend funds was directly due to the dental profession's opposition to President Truman's plan for compulsory health insurance. A spokesman insisted that the Bureau feels that the dental institute can be accommodated, at least for the first few years, in the medical research and clinical center now under construction at suburban Bethesda, Md. However, on March 14, in testimony before the Senate Appropriations Committee, conducting hearings on the Public Health Service budget, Bruce Forsyth stated that space limitations would preclude efficient operation of the dental institute in the research center. In this he was joined by Dr. Norman Topping. Assistant Surgeon General Forsyth has general supervision of all USPHS dental activities and Dr. Topping is associate director of National Institutes of Health, of which the dental institute is a component.

USPHS Dental Consultants

Dr. Forsyth, incidentally, has completed selection of an impressive roster of dental consultants to USPHS. Members and the fields in which they will give expert assistance are as follows:

Philip E. Adams, Boston, administration and organization, and orthodontia; John E. Buhler, Emory University, audiovisual education, and methods and materials; Russell W. Bunting, University of Michigan, dental education and auxiliary personnel training; George W. Christiansen, Detroit, hospital dental services and oral surgery; James M. Dunning, Harvard University, industrial oral health and clinical investigations; Leroy M. Ennis, University of Pennsylvania, dental roentgenology and diagnosis; Paul H. Jeserich, University of Michigan, graduate and postgraduate dental education; Kenneth A. Easlick, University of Michigan, dental public health and preventive dentistry; Melvin Dollar, executive director of Group Health Association, Washington, D.C., dental economics and statistical research.

Speaks for Dentistry

Sen. Lester C. Hunt (D., Wyo.), the only dentist-member of the United States Senate, is proving to be one of its busiest and most widely traveled speechmakers. Still deeply interested in matters affecting the profession, notwithstanding the fact that he has assumed added responsibilities as a member of the Armed Services Committee, Sen. Hunt has accepted invitations to speak at dental meetings this spring in Atlanta, Dallas, Kansas City, Baltimore, Milwaukee, Nashville, Boston and New York.

A. D. A. AFFAIRS

PRODUCT CLASSIFICATIONS CHANGED AT CHICAGO MEETING

At the joint meeting of the Council on Dental Therapeutics and the Advisory Committee to the Bureau of Chemistry, held in Chicago February 10 and 11, a new classification of commercial products was instituted. This followed the action of the Board of Trustees in its approval of the Council's new classification program.

Under the new system, a product will fall into one of four groups: A, B, C, or D. In the past, products were listed simply as "Accepted" and "Non-accepted." A more specific grouping of therapeutic dental products will henceforth be available to interested dentists. The April JOURNAL will carry a detailed Council report covering the new classification.

1950 SURVEY OF DENTAL PROFESSION SET FOR APRIL

One fourth of all dentists in the United States will be asked to participate in the 1950 Survey of the Dental Profession which will get under way early in April conducted by the A.D.A. Bureau of Economic Research and Statistics.

Various aspects of dental practice will be covered by the questionnaire, which will go to approximately 20,000 dentists, such as types of practice—individual, partnership, group or employment by another dentist—and so forth. The size of the office staff will be considered, with questions on types of dental auxiliaries working full or part time.

A space in the form will be provided for a record of the week of April 16 to 22, and will ask the number of individual patients treated during that period, their ages and type of work.

Other questions will cover professional activities in 1949, including the number of weeks worked, length of vacations and the total number of different patients.

All information will be confidential as it will not be necessary to sign the forms. The survey's results should prove interesting to every dentist as they will provide standards with which to compare his own practice. Current proposals for federal compulsory health insurance makes it necessary that organized dentistry be well-armed with facts about the profession.

ASSISTANTSHIPS OPEN AT A.D.A. CHEMICAL LABORATORY

Establishment of a new program of dental research assistantships for two postgraduate students of chemistry has been established jointly by the American College of Dentists and the American Dental Association. The program will be carried out under the direction of the A.D.A. Bureau of Chemistry, using the facilities and equipment of the A.D.A. chemical laboratory.

Recent graduates in chemistry who ranked in the upper quarter of their class and who expect to enter graduate study in a recognized university in the Chicago area will be eligible.

The two students selected for the assistantships will be paid a salary of $2,500 each, through funds made available in a special grant from the American College of Dentists and an equal sum allocated by the A.D.A.

The students will be required to work part-time on special research projects, including studies in the development of specifications for dental therapeutic items and other projects in the field of dental science.

The program will get under way early

this summer. Further information and application forms may be obtained by writing to the Council on Dental Therapeutics, American Dental Association, 222 East Superior Street, Chicago 11.

A.D.A. CAMPAIGN TO REPLACE DENTAL TEXTBOOKS IS LAUNCHED

The A.D.A. has undertaken a campaign to replace dental textbooks and reference works in university libraries of war-torn countries through the medium of the CARE-UNESCO book program. A goal of $250,000 has been announced by Stanley D. Tylman, chairman of the A.D.A. Council on International Relations.

The motivation behind UNESCO's campaign to replace scientific books in the world's libraries is best understood by its own definition of the cause to which it is dedicated:

UNESCO is a specialized agency of the United Nations which seeks better understanding among the peoples of the world through education, science and culture. As the war ended, UNESCO sought not only the physical reconstruction of educational facilities of war devastated countries but to stimulate again the free flow of ideas in all parts of the world, particularly where teachers and professional men had been muzzled and thoughts controlled. It renewed the search for a common bond among peoples. It brought intellectual leaders together again, so that old and unsolved problems—and the war's tragic aftermath—could be studied and progress resumed.

Its goals can be briefly summarized: (1) Stimulation of world-wide efforts to wipe out illiteracy as a first step in raising the standards of living; (2) The broadest use of schools, libraries, press, publications, films and radio for the spread of knowledge and understanding among peoples; (3) Encouraging the world-wide interchange of ideas and cultural achievements; (4) Stimulating the cooperation of scientists and making available the results of their research; (5) Identifying and helping to remove social, religious, and racial tensions

Planning ahead for the 91st annual session of the American Dental Association, to be held in Atlantic City October 30 to November 2, the committee for arrangements met at convention headquarters in February to inspect facilities. Shown above are (l. to r.) Eugene Westcott, vice chairman, Atlantic City; L. M. Cruttenden, assistant secretary, A.D.A., Chicago; Edward P. White, general chairman, Jersey City, N. J.; Harold Hillenbrand, secretary, A.D.A., Chicago, and Ben Rossenwasser, vice chairman, Union City, N. J.

Stanley D. Tylman, chairman of the A.D.A. Council on International Relations, is shown (l.) turning over the first check in the CARE book program to President Philip E. Adams, during the San Francisco meeting last October

and combating the prejudices and ignorance which hinder friendly relations.

One of the most important programs of UNESCO will be aiding CARE—the Cooperative for American Remittances to Europe—which has now expanded its drive for food and clothing to include books.

Many of the dental institutions in the war-torn areas lost their entire libraries, laboratories and clinics. To help alleviate this condition, the officers and trustees of the American Dental Association have authorized sending as a gift to these institutions complete sets of the *Index to Dental Periodical Literature*, each set valued at $150. To date dental institutions in 33 countries have received these volumes for a total value of $11,500. Shipment was made through foreign embassies located in the United States.

Recently CARE has announced a plan for sending books to dental institutions or organizations in Europe. Included on CARE's list are books related to all phases of dentistry. These books, about 50 in number, are the most recent and authoritative in their particular fields and have been selected by a committee headed by Luther H. Evans, Librarian of the United States Congress.

In the effort to help dentists and dental schools in the devastated areas, CARE has worked out a plan with the American Dental Association, whereby it will be possible to place these recent books in libraries of schools or dental organizations. These will be a nucleus from which the future dental library will evolve.

Any donor of $10 or more will have the privilege of indicating the type of book and the institution receiving his gift. Smaller donations will be placed in a common American Dental Assocation Fund and dispersed through CARE for dental books. All donations will be held in a special fund in the A.D.A. Central Office, and turned over to CARE with proper instructions. More information will be given in the next issue of THE JOURNAL as to titles of books available, institutions and the plan for soliciting contributions.

Contributions should be sent to CARE Program, American Dental Association, 222 East Superior St., Chicago 11.

APTITUDE TESTING FOR DENTAL SCHOOL ENTRANCE TO CONTINUE

Specific plans for conducting aptitude tests for dental school applicants were reviewed and approved by the Council on Dental Education at its February 3rd meeting in the Central Office, noting that the first five-year program of such testing, now nearing completion, resulted in marked success.

The aptitude testing program was instigated with the freshman dental classes in 1946, at the request of the dental schools. At the San Francisco session last October, the House of Delegates author-

ized the Council on Dental Education to place the program on a national basis. The usefulness of employing tests as a means of predicting student success has been shown by the experimental program that has been conducted for the past four years by the several schools using aptitude testing as a means of selection.

At the February meeting of the Council, under the chairmanship of Robert W. McNulty, Dean of the Chicago College of Dental Surgery, Loyola University, a plan was worked out whereby applicants to the class enrolling in the fall of 1951, might take the dental aptitude tests at any one of four times and at approximately 80 testing centers.

The Committee on Aptitude Testing decided that the first group of tests will be held at Thanksgiving time this year, using the facilities of the 39 cooperating dental schools as "testing centers." In addition, aptitude testing will be conducted in 36 other centers, specifically colleges and universities scattered strategically throughout the U.S., and Puerto Rico, Hawaii and Alaska. The Committee is making plans for other tests to be held during the 1950 Christmas season, in February, 1951, and in April of next year.

Prospective dental students should make application direct to the schools of their choice, rather than to the A.D.A. If the school is interested in the applicant, it notifies the Council on Dental Education. Application blanks are then sent to the interested person which serve to collect the $10 testing fee and allocate him to a testing center of his choice, if possible.

It has been found that the average student applies to three or four schools for entrance. He takes but one test, however, and pays only one examination fee. Test results are processed by the Council, which sends the records, without charge, to the schools.

Of the estimated 10,000 or 11,000 applicants to dental schools each year, possibly 8,000 will be given tests. Of these, freshman classes can accept about 3,150 students.

NEW LITERATURE AVAILABLE FOR DISTRIBUTION TO CHILDREN

Two new pieces of literature now available through the A.D.A.'s Council on Dental Health are designed especially for children in the upper grades, and for use in the dentist's reception room.

An exceptionally well-illustrated revision of the booklet "Your Teeth—How They Grow," explains the eruption of the first teeth, how they are replaced with the adult set and the construction of a tooth. Copies of this booklet are available at $3.37 for 25, $5.80 for 50 and $9.93 per hundred copies.

"Home Care of the Mouth" is the title of a single sheet dealing with proper brushing methods. The student is shown by example the eight important steps in cleaning tooth surfaces. Copies are priced at 25 cents for 25, 45 cents for 50 and 80 cents for 100.

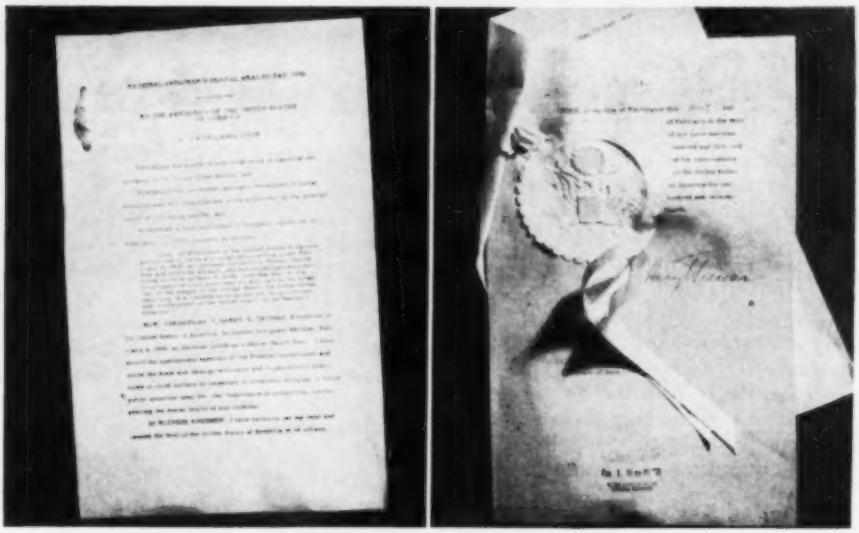
Sample copies of both may be obtained free on request.

CONTRIBUTIONS TO A.D.A. RELIEF FUND HIT NEW HIGH

More than 30,000 contributors to the American Dental Association Relief Fund had donated $78,857.52 by mid-March, as a result of Christmas Seal sales and a follow-up "red letter" appeal in February.

From March 1 to 15, 933 contributors had mailed in $3,071 for addition to the Fund. All contributions are used exclusively to provide financial assistance to members of the dental profession who, through accident or illness, are unable to support themselves.

John S. Owens, chairman of the A.D.A. Relief Fund, has issued a final appeal to



The document which gave such impetus to the observance of National Children's Dental Health Day on February 6 was President Truman's proclamation, pictured above. The president affixed his signature and the Seal of the United States on February 1, witnessed by officers of the A.D.A. and legislators responsible for passage of the bill

all dentists who have not yet sent in their contributions. The total received is still approximately $22,000 short of the $100,000 goal set for 1950.

INDEX TO DENTAL LITERATURE IS NOW AVAILABLE

The Bureau of Library and Indexing Service announces that the latest volume of the *Index to Dental Literature*, in the English language is now ready for distribution.

One hundred and forty-four publications from Australia, Canada, England, India, New Zealand, South Africa and the United States are covered in this volume. Material is arranged alphabetically according to subject and author entries.

Price of the present volume is $10. Orders should be directed to the Order Department, American Dental Association.

DENTAL SOCIETIES

CLEVELAND SOCIETY INVITES DENTISTS TO SPRING MEETING

An invitation to all dentists has been issued by the Cleveland Dental Society to attend the annual Spring Clinic Meeting at the Hotel Hollenden, May 1 to 3 inclusive.

In the three day meeting, the society is offering "the best essayists and clinicians obtainable, rounded out with commercial and visual education visits," with ample time provided for relaxation, entertainment and fellowship.

Publicity Chairman Harold C. Miller has announced that guests should make

their own reservations at the Hotel Hollenden as early as possible. Further information on the meeting may be obtained from Louis C. Meier, General Chairman, Annual Spring Clinic Meeting, 4169 Pearl Road, Cleveland.

PHILIP E. ADAMS TO BE HONORED AT TESTIMONIAL DINNER

Philip E. Adams, president of the A.D.A., will be given a testimonial dinner by the Metropolitan District Dental Society at the Hotel Somerset, New York, on the evening of April 22.

The affair will be held in the hotel's Louis XIV ballroom, with dinner served to dentists and their ladies at 7:30 p.m. According to an announcement by the society's executive committee, reservations will be honored in order of their acceptance. Tables of 12 may be arranged for groups if desired. Dress is optional.

"SUGAR AND DENTAL CARIES" SUBJECT OF CALIF. SYMPOSIUM

As part of the California State Dental Association meeting, April 22-24, a three day symposium on "Sugar and Dental Caries" will be featured, with papers presented by eminent authorities on the subject.

Henry M. Leicester, Ph.D., will act as moderator for all discussions with participants including Joseph Volker, University of Alabama; Paul Pincus, Middlesex Hospital, London, England; L. S. Fosdick, Northwestern University; Julian D. Boyd, Iowa State University; Reidar F. Sognnaes, Harvard School of Dental Medicine, and Hermann Becks, University of California.

Subjects will cover the scope of knowledge of the caries process, how sugars may cause caries, observations of children living under controlled diets and pre-eruptive factors.

The California State Dental Association has extended an invitation to all of American dentistry to share in what they term their "unique program."

KANSAS AIDS NEW DENTISTS IN CHOOSING LOCATIONS

Distribution of dentists in Kansas and pertinent data on locations have been prepared for dental school graduates by the Division of Dental Health, Kansas State Board of Health.

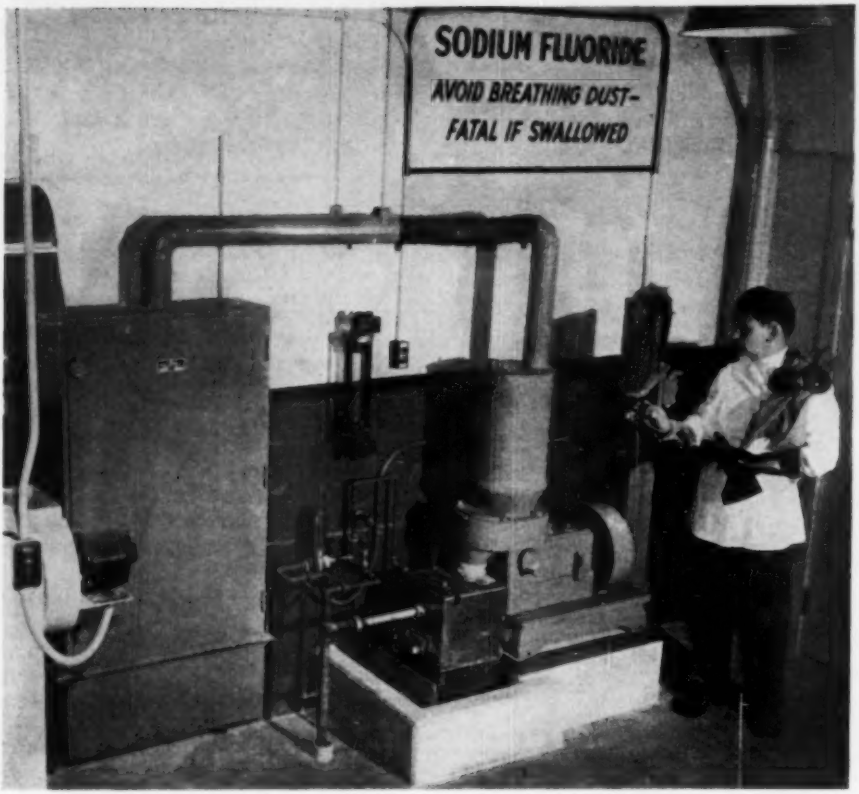
The distribution maps, the first of which was prepared in April last year, supplies such information as the number of dentists in each county, population per dentist by counties and expendable income per family per county. Also indicated are counties which need additional dentists.

The director of the Division of Dental Health, Leon R. Kramer, feels that this type map is a valuable aid to the new graduate who seeks basic information on Kansas locations. Dr. Kramer said that as a result of this guidance a number of 1949 graduates located in rural areas "and each one of them is enjoying pleasant living conditions and a lucrative practice."

OKLAHOMA DENTIST ANNOUNCES CANDIDACY FOR CONGRESSMAN

Lloyd E. Church, member of the Oklahoma State Dental Association's Southwestern District, and a resident of Clinton, has announced his candidacy for the Democratic nomination for congressman in the Seventh District.

Dr. Church is well known to voters in that area for his many years of work in soil conservation and as president and secretary of the Southwestern District.



The first sodium fluoride treatment plant in Florida is shown above soon after its installation in the Gainesville water plant. The Alachua County Dental Society, responsible for its purchase, anticipates that the fluoride content in the city water will cut down tooth decay by 50 to 65 per cent.

GAINESVILLE (FLA.) INSTALLS SODIUM FLUORIDE PLANT

Through the efforts of the Alachua County Dental Society, the city of Gainesville, Fla., has installed a sodium fluoride treatment plant in the municipal water supply system, the first such installation in Florida and the second in the South.

According to Donald Morrison, Sr., president-elect of the Florida State Dental Society and a Gainesville resident, the Alachua County Society was largely responsible for the adoption of the fluorination program. The Society conducted an "educational" program aimed at the city commission, the state board of health, the county health unit and the medical society.

Dr. Morrison believes that the fluoride program will be adopted by other cities in Florida and throughout the South, but that the impetus must start with local dental societies and carry through "for the advantage of dentistry and the future health of our children."

Harry A. Mesjian, president of the Philadelphia County Central Society is shown above watching a group of Philadelphia school children who demonstrated health education activities at the 1950 Greater Philadelphia Dental Meeting in February. More than a score of children, representing various age groups, participated in the special program which was presented simultaneously with the table clinics. The exhibit attracted considerable attention among the 5,000 dentists and guests who attended the meeting.

GEORGIA DENTAL JOURNAL APPOINTS NEW EDITOR

Roger E. Sturdevant, professor of dental prosthesis at the Emory University School of Dentistry, Atlanta, has been appointed editor of the *Journal of the Georgia Dental Association*.

Dr. Sturdevant assumed his editorial duties with the January issue, and is the first full time editor since the death of R. H. Murphy on April 25, 1949. J. M. Heard, Jr., secretary-treasurer of the Georgia association acted as editor for the remainder of last year.

Dr. Sturdevant is a 1916 graduate of the Dental School of the University of Nebraska, and joined the faculty at Emory in 1938. He has served as president of the Atlanta Dental Society, and was elected to the first presidency of the Northern District Dental Society in 1947.

DENTAL EDUCATION

JAMES T. GINN APPOINTED DEAN OF TENNESSEE DENTAL SCHOOL

James T. Ginn, chief of the Division of Operative Dentistry of the University of Tennessee College of Dentistry, Memphis, has been appointed dean of that school, succeeding R. D. Dean who is retiring.

Dr. Ginn will become dean of the college July 1, and will serve as acting dean until that time. Dr. Dean, widely known for his contributions to dental education for almost 30 years, will be granted a

leave of absence until his retirement becomes effective June 30. He has served as dean of the college since 1941.

Dr. Ginn, formerly assistant professor of pathology at Loyola University, New Orleans, joined the faculty in Memphis four years ago as associate professor of oral medicine and surgery.

SCHEDULE HYGIENIST SEMINAR AT MARQUETTE UNIVERSITY MAY 12

The first annual Postgraduate Seminar for Dental Hygienists will be presented by the Postgraduate Division of Marquette University, School of Dentistry, on May 12 in Milwaukee.

The seminar will be held in the auditorium of Marquette University Medical School, and is scheduled to begin at 9:30 A.M. Prominent educators in the fields of pathology, periodontics and histology will address the group in the morning session, while the afternoon will be devoted to a round table discussion on the hygienist's role in caries control and prevention.

Further information may be obtained from Miss Beth M. Linn, D.H., Marquette University School of Dentistry, 604 N. 16th Street, Milwaukee 3.

U.S.C. DENTAL STUDY CLUB TO MEET IN MEXICO CITY MAY 14

The third annual seminar of the University of Southern California Dental Study Club of Mexico City will be held on May 14, 15, 16 and 17 in Mexico City, according to an announcement from Roberto M. Ruff, secretary.

GRADUATE COURSES OFFERED BY UNIVERSITY OF TORONTO IN APRIL

Postgraduate courses in oral surgery and pedodontics will be held at the Faculty of Dentistry, University of Toronto, beginning in mid-April according to an announcement by Roy G. Ellis, dean.

The continuation course in oral surgery will begin on April 17, with classes in session for five days, and will be directed by J. H. Johnson, head of the Department of Dental Surgery and Anesthesia. Reed Dingman, associate professor of dental oral surgery at the University of Michigan, and F. W. Clement, Toledo, Ohio, will be guest clinicians.

The course in pedodontics is scheduled for the week of April 24-28, under the direction of S. A. MacGregor and M. A. Cox. Preventive measures and operative dentistry for children will be combined in the course. Philip Jay, professor of dentistry, University of Michigan, will be the guest lecturer and clinician.

OHIO STATE TO SPONSOR APRIL SEMINAR AND ASSEMBLIES

The Mid-Century Post-College Assembly of the College of Dentistry, the Ohio State University, will be held on April 19 and 20, according to an announcement by President Howard L. Bevis.

An Oral Cancer Seminar will be presented on April 21, sponsored jointly by the Ohio Division of the American Cancer Society and the Ohio State University.

DENTISTS OFFERED SHORT COURSE AT TUFTS DENTAL SCHOOL

Tufts College Dental School will initiate a new program in dental education when the first annual Berkshire Conference in periodontology and oral pathology is held at Eastover, Lenox, Mass., June 13 through 17.

With the purpose of offering an intensive curriculum of recent advances in the diagnosis and treatment of perio-

dontal and oral diseases, the conference will consist of four days of lectures, seminars and panel discussions. The staff will be made up of outstanding teachers and clinicians in periodontology, oral pathology and related medical fields.

Registration will of necessity be limited to the earliest applicants who may secure forms and information by writing to The Berkshire Conference, Tufts College Dental School, 136 Harrison Ave., Boston.

ORTHODONTICS COURSES OFFERED BY UNIVERSITY OF WASHINGTON

The University of Washington School of Dentistry has announced that the next graduate and postgraduate courses in orthodontics will begin September 25, with all applications to be received by the school before June 1.

The class will be limited to 10 students and will require full-time residence for a minimum of five quarters. The graduate and postgraduate courses are the same, except that the graduate student must write an original thesis. Postgraduate students will receive a certificate, while the graduate course leads to a Master of Science degree. A similar program in pedodontics is offered.

Requests for application forms or for additional information should be directed to the Director of Postgraduate Dental Education, School of Dentistry, University of Washington, Seattle 5, Washington.

THREE-DAY NUTRITION STUDY OFFERED BY TORONTO

Recognizing the fact that the nutritional status of the patient is of importance in the practice of dentistry, the Faculty of Dentistry, University of Toronto, will conduct a three-day course in nutrition starting May 18.

The graduate course will begin immediately after the combined meeting of the Canadian Dental Association and the Ontario Association. Hermann Becks, Professor of Dental Medicine at the University of California, will conduct the course on the application of nutrition to dentistry. Dr. Becks will describe normal nutrition, evidences of abnormal nutritional conditions and treatment measures.

The tuition fee for the course is $15. Inquiries regarding enrollment may be directed to The Dean, Faculty of Dentistry, University of Toronto, 230 College Street, Toronto, Ontario.

SECOND SERIES OF COURSES BY TELEPHONE OFFERED IN 1950-51

As a result of the success of its first postgraduate course transmitted by telephone to dental societies from coast to coast, the University of Illinois College of Dentistry will offer a second series of round table symposia on five different phases of dentistry this year and next.

The new series is being given in response to requests from a large number of dental societies now participating in the first course and others which were unable to enroll. A combined membership of more than 7,000 in 169 societies are now enrolled in the series.

Though the general topic, "Current Advances in Dentistry," remains the same, new subjects and an entirely different faculty have been chosen for the two-hour lectures which, in the new series, will be given once a month from November, 1950, through March, 1951.

Isaac Schour, associate dean of the dental college, which adopted the nationwide telephone network as an economical method of informing the dental profession as a whole, has pointed out that the idea has been growing by leaps and bounds.

Dentists who congregate in various centers to hear the lectures pay a fee of $10 each for the two-hour lessons. The 7,600 dentists now enrolled have registered such enthusiasm that some 3,000 more show up at each lecture and ask to participate. It is estimated that the series now has more outlets than many major radio networks.

Enrollment of dental societies and study clubs for the 1950-51 series will be accepted until March 15, 1950. The minimum fee for any one group is $250.

THREE SUMMERTIME COURSES OFFERED BY PENNSYLVANIA

The University of Pennsylvania's Thomas W. Evans Museum and Dental Institute School of Dentistry, keeping pace with the increasing demand for specialized courses within the profession, has announced a schedule of three postgraduate periods for late spring-early summer study.

According to Lester W. Burket, Director of Postgraduate Courses, the roster will include mechanical principles of restorative dentistry, a refresher course for dental hygienists and a six-day course in teaching technics for teachers of dentistry. An outstanding faculty has been named for the courses, which will include both lectures and practical demonstrations.

Complete information on these courses may be obtained from Dr. Burket at 40th and Spruce Streets, Philadelphia 4.

BOARD OF PEDODONTICS DECIDES AGAINST PRECEPTOR TRAINING

The American Board of Pedodontics, at their meeting on February 2, 3 and 4 in Ann Arbor, Michigan, passed a resolution to the effect that training for the specialty of pedodontics by a preceptor is not acceptable to the board.

The resolution said in part: "The American Board of Pedodontics does not recognize training by a preceptor in a private office and such training will not satisfy the educational requirements listed under IIA of the board's Requirements for Certification."

The board also announced the names of five men who successfully passed the recent examination to specialize in pedodontics. They were: I. Irwin Beechen, Oakland, Calif.; David Barclay Law, Seattle, Wash.; Bernard Z. Rabinowitch, Los Angeles; Samuel Stulberg, Detroit, and Helmut A. Zander, Boston.

RESEARCH

MOTT FOUNDATION OFFERS PEDODONTIA GRADUATE STUDY

For those dentists who can meet the entrance requirements of the School of Graduate Studies of the University of Michigan, two fellowships in graduate dentistry for children are made available by th Charles Stewart Mott Foundation of Flint, Michigan.

Each fellowship provides for 12 months of formal graduate study at the W. K. Kellogg Foundation Institute of Graduate and Postgraduate Dentistry at the University of Michigan (September 1, 1950 to August 31, 1951) with a living stipend made available of $125 per month and with tuition paid for two semesters and the ensuing summer school session.

After this amount of formal instruction, the candidate agrees to provide 12 months of dental service for children in the Children's Clinic of the Mott Foundation Health Center, Hurley Hospital,

Flint, Michigan, at a salary of $4000 for the twelve-month period. During this period of practice, a research problem may be completed and reported in a thesis in order to fulfill the final requirements for a master's degree in dentistry for children at the University.

Qualifications for a fellowship are a sincere interest in dentistry for children and the achievement of an undergraduate academic record which places the candidate scholastically in the upper third of his graduating class. Such an achievement should approximate a B average in grades.

Interested dentists and senior dental students may contact Kenneth A. Easlick, Professor of Dentistry, University of Michigan, Ann Arbor, Mich., for complete details.

DR. HAMPP FIRST DENTIST TO RECEIVE SCIENCE AWARD

Edward G. Hampp

Edward G. Hampp, of the National Institutes of Health at Bethesda, Md., was announced winner of the 1949 Academy Award in the biological sciences at the January 28 meeting of the Washington Academy of Sciences, thus becoming the first dentist to be so honored.

The Academy and its 19 affiliated societies limits its awards to persons under 40 who make noteworthy contributions to the physical, biological and engineering sciences. F. H. H. Roberts, retiring president, said in announcing the award that it was granted to Dr. Hampp "in recognition of original and fundamental contributions to the knowledge of diseases of the oral cavity, and because of being the first to isolate in pure culture *Borrelia vincenti*, thus making possible new approaches to the study of spirochetes."

Dr. Hampp, a research associate under an A.D.A. Fellowship at the Bethesda institute, was formally presented with the award at a meeting of the Academy in Washington on March 16.

News of Dr. Hampp's award was published in "The National Scene" section, page 344 of the March JOURNAL.

GOVERNMENT APPROPRIATION SOUGHT FOR RESEARCH BUILDING

Renewed efforts to obtain approval of an appropriation of $1,900,000 for a building to house the National Institute of Dental Research were launched last month by the A.D.A. Council on Legislation in a letter to Sen. Kenneth McKellar (D., Tenn.), chairman of the Senate Appropriations Committee.

The Council requested Senator McKellar to launch final action on an appropriation authorized in 1948 by the 80th Congress. To date, only $100,000 has been granted of the originally authorized $2,000,000. President Truman failed to request the final appropriation in either his 1949 or 1950 budget messages.

LEGISLATION

PROPOSED BILL ALLOWS FOR DENTAL CARE DEDUCTIONS

A bill to increase the amount of deduction allowed for income tax purposes with respect to medical and dental care expenses was introduced by Rep. Caleb Boggs (R., Del.) in the House of Representatives last month.

The bill, H. R. 7418, allows deductions for "expenses paid during the taxable

year, not compensated for by insurance or otherwise, for medical and dental care of the taxpayer, his spouse or a dependent."

COMPLETE HEARINGS ON REPEALER TO MASS. DENTAL NURSE BILL

Hearings on House Bill 2034 before the Massachusetts Legislature's committee on public health were completed last month, with no action being taken at press time of THE JOURNAL. The bill is now under advisement by the committee.

House Bill 2034 would, if enacted, abolish the dental nurse training program put into effect in Massachusetts last July.

PUBLIC HEALTH

PUBLIC HEALTH SERVICE OFFERS FELLOWSHIPS

The Public Health Service, Federal Security Agency, has established a series of research fellowships to encourage the most brilliant and promising students and scholars from the United States and abroad in a career of research in the dental and allied fields

The research fellowships, which are supported from funds appropriated by Congress to the National Institutes of Health, are awarded in the name of the National Institute of Dental Research. The research fellowship program is interested in supporting basic research in the dental and allied fields and in the support of dentists working toward an advanced degree in any of the basic sciences.

The research fellow may elect to study in the United States or abroad, at the institution of his choice. Predoctoral Research Fellows (Master level) receive a basic stipend of $1,600, to which a dependency allotment of $400 may be added. In addition, tuition is paid. Postdoctoral Research Fellows receive a basic stipend of $3,000, to which a dependency allotment of $600 may be added. If the postdoctoral Fellowship is renewed, the basic stipend is $3,300. A $500 grant-in-aid for the partial support of postdoctoral Fellows may be requested by the sponsoring institution.

All correspondence in connection with these fellowships should be addressed to the Research Fellowships Branch, Division of Research Grants and Fellowships, National Institutes of Health, Bethesda 14, Md.

SOUTHERN BRANCH, A.P.H.A. DENTAL SECTION, TO MEET

Speakers prominent in the ranks of dental public health will be featured in the program of the Dental Section, Southern Branch, American Public Health Association, at the Birmingham, Ala., meeting, April 27 to 29.

Philip E. Blackerby, Jr., will open the general session on Friday, April 28, with the topic "Are Dental Public Health Programs Paying Off?" Dr. Blackerby is director of the Division of Dentistry, W. K. Kellogg Foundation, Battle Creek, Mich.

The Dental Section will begin proceedings at 2:00 p.m., the same day, with Francis A. Arnold, Jr., speaking on the fluoridation of water supplies. Dr. Arnold, who is associate director for the National Institute of Dental Research, Bethesda, Md., will be assisted by two discussors from southern health departments.

Richard C. Leonard, chief of the Division of Oral Hygiene, Maryland State Department of Health, will discuss dental service under the Maryland medical care program, with two dentists from southern cities as discussors.

"The Richmond Schools, Dental Care Research Program," will be the subject of a paper presented by George E. Water-

man, senior dental surgeon of the Public Health Service of Richmond, Ind. A. H. Trithart, regional dental officer of the Tennessee State Department of Health will participate as a discussor.

ARMED FORCES

TWO NAVY DC CAPTAINS PROMOTED TO REAR ADMIRAL

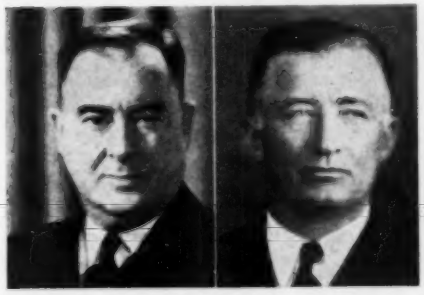
Henry Raymond Delaney and Daniel W. Ryan, both of whom hold the rank of Captain in the Dental Corps, U.S. Navy, have been selected for promotion to the rank of Rear Admiral according to an announcement by the Bureau of Medicine and Surgery, Navy Department.

Captain Delaney is presently serving as Deputy Chief of the Dental Division in the Bureau of Medicine and Surgery. He has been in the Navy Dental Corps since 1917 when he received his degree of D.M.D. from Tufts College Dental School. Captain Delaney has served in many capacities during his naval career, including sea duty aboard such ships as the USS Tennessee, USS Wyoming and the armored cruiser Frederick. He is a member of the A.D.A., American College of Dentists and the American Association for the Advancement of Science.

Captain Ryan is currently Senior Dental Officer and head of the dental department of the U.S. Naval Academy, and Command Dental Officer for the Severn River Naval Command, a post he has held for two years. His naval career began in 1925 as Assistant Dental Officer at the Naval Training Station in Norfolk, Va.

Captain Ryan has had extensive sea duty aboard Pacific fleet ships including the USS Lexington, USS Relief and the USS Rigel. In 1934-35 he served as Staff Dental Officer with Commander, Yangtze Patrol, aboard the USS Luzon.

A native of Manchester, Iowa, Captain Ryan attended the University of Iowa and Coe College, receiving his D.D.S. from the University of Denver in 1923. He is a member of the A.D.A., a Fellow in the American College of Dentists and the International College of Dentists.



Capt. H. R. Delaney Capt. D. W. Ryan

FIRST ARMED FORCES DAY TO BE OBSERVED MAY 20

With the official slogan "Teamed for Defense," the first Armed Forces day will be observed throughout the United States on May 20, marking the 1950 recognition and appreciation day for the armed services.

Reserve forces and civilian components will be encouraged to participate actively in the observance, the Department of Defense has announced. Assistance will be requested from national headquarters of leading civic, professional, veterans, women's, labor and religious organizations which will ask local participation by member chapters, societies, clubs and posts.

ARMED FORCES INSTITUTE FELLOWSHIP AVAILABLE

An A.D.A.-sponsored Fellowship in Dental and Oral Pathology is available at the Armed Forces Institute of Pathology, Washington, D.C., as one of the activities

of the Council on Dental Museum and Dental Registry.

The training received during this period is applicable toward board certification in oral pathology. The Fellowship may be filled at any time a suitable applicant is available, although the normal procedure would be that the study begin on July 1, and run for one year with the possibility of renewal. The stipend is $3,600 per year.

Applicants desiring further information should address Lt. Col. Joseph L. Bernier, DC, Executive Secretary, The Registry of Oral Pathology, Armed Forces Institute of Pathology, Washington 25, D.C.

VETERANS

NATIONAL DENTAL VETERANS LEAGUE IN DISBANDMENT

The National Dental Veterans League, originally formed with the purpose of pointing up the need for reorganizing the federal dental services, has disbanded, according to an announcement by James M. Glenn, Collierville, Tenn., who has acted as secretary-treasurer of the group.

In announcing the dissolution, Dr. Glenn expressed appreciation of all the officers to the membership for the "splendid spirit in cooperating to put over our major purpose of proposed independent administration of the Dental Corps," and stated that since "we have accomplished our major mission, we, the members of the National Dental Veterans League, declare ourselves, as of this date (Feb. 10), disbanded."

The League's "major mission," that of urging the A.D.A. to take action in the federal dental services reorganization, was successful when the House of Delegates, during the San Francisco meeting last year, adopted a policy for reorganization.

INTERNATIONAL

HENRY KLEIN APPOINTED DENTAL SUPERVISOR OF D.P.'S

Henry Klein, of the U. S. Public Health Foreign Quarantine Service, will supervise dental examinations of Displaced Persons scheduled to enter the U. S. from Europe during 1950. In this capacity he will also serve as liaison officer between American and European dentists.

Dr. Klein has been dental director for the American Joint Distribution Committee (JDC), one of 21 voluntary private relief agencies working with the International Refugee Organization in assisting D.P.'s. During the past year and a half he has organized dental services for Jewish D.P. camps in Germany, Italy and Austria.

As liaison officer, Dr. Klein will lecture and show films on latest developments in American dentistry, at the same time keeping pace with new findings by his European colleagues.

WORLD HEALTH DAY CHANGED TO APRIL 7 OBSERVANCE

World Health Day, which was observed by more than 30 countries last year on July 22, will be observed this year and hereafter on April 7, the date when the World Health Organization constitution went into force in 1948.

The change in the observance date was decided upon by the W.H.O. Assembly in order to provide a better opportunity for schools and organizations to join in the observance.

The theme for the international celebration of World Health Day, 1950, will be "Know Your Health Services." Emphasis will be placed on encouraging public interest in national health problems and services offered.

INT'L ASSOCIATION FOR DENTAL RESEARCH IN MAY N.Y. MEETING

The New York Section of the International Association for Dental Research will be held on the evening of May 4, at the Guggenheim Dental Clinic, 422 East 72nd Street.

Isaac Neuwirth, secretary of the section, has requested that members and guests who wish to present papers at the meeting communicate with him immediately, stating titles of the papers, names of authors, name of institution in which research was conducted, and approximate time required for presentation. Three abstracts of not over 200 words must accompany the data, with all information reaching Dr. Neuwirth not later than April 20.

Abstracts of papers presented on the program will be published in the *Journal of Dental Research*.

GENERAL NEWS

REGISTRY TITLE CHANGED BY COUNCIL ACTION

At the February 6 meeting of the Council on Dental Museum and Dental Registry, it was voted to formally change the name of the Registry from "The Registry of Dental and Oral Pathology" to "The Registry of Oral Pathology."

Council members felt that both the words "dental" and "oral" in the title, due to similar meanings, were redundant.

DENTAL TRADE ASSOCIATION HIT IN F.T.C. "MONOPOLY" ORDER

An order to terminate what it considered a "conspiracy to fix prices and otherwise eliminate competition" in the manufacture and distribution of dental goods was issued recently by the Federal Trade Commission against the American Dental Trade Association, six of its officers and 143 manufacturers and distributors.

The companies named are located in 36 states and distribute more than 75 per cent of all dental goods used in the United States, including instruments, laboratory compounds, artificial teeth and office equipment.

The Commission reported that the A.D.T.A. violated the Federal Trade Commission Act in that they "carried on an unlawful agreement, combination, understanding and conspiracy to hinder, lessen, eliminate, limit and restrain" price and other competition and to "monopolize" within themselves the manufacture and distribution of dental goods.

In addition to directing the respondents to terminate these activities, the F.T.C. ordered the Association to cease disparagement of non-members and dealers as "gripsackers," "carpetbaggers," "illegitimate," "price cutters" and "unauthorized."

The A.D.T.A. has agreed to a consent order to avoid lengthy hearings. It issued a statement which said, "Compliance with this order will be simple since the members of this Association have merely agreed not to do things which they deny doing anyway."

N.Y.U. COLLEGE OF DENTISTRY MARKS 85TH ANNIVERSARY

New York University College of Dentistry will celebrate its 85th birthday on the evening of April 14 with ceremonies and a dinner dance at the Waldorf Astoria Hotel. The date will also mark the dental school's 25th anniversary of its

affiliation with New York University.

Tickets for the event will cost $10 per person or $100 per table. George A. Buckley, in charge of dinner arrangements, has requested that table reservations be made as soon as possible to better facilitate seating arrangements. Dress will be optional, with dancing following the dinner. Dr. Buckley has suggested that checks be made payable to N. Y. U. Alumni Office, 100 Washington Square, New York 3.

PROSTHODONTICS BOARD TO MEET IN MAY AT MILWAUKEE

The American Board of Prosthodontics will hold its next executive meeting for the consideration of applications for examination, the first week in May, in Milwaukee, according to an announcement by Irving R. Hardy, secretary-treasurer.

Candidates who wish to take the examination, set tentatively for February, 1951, are urged by Dr. Hardy to submit their applications to him as early as possible.

Effective January 1, 1954, an applicant must have a Master's Degree or its equivalent in the field of prosthodontics from an approved or provisionally approved dental school.

CHICAGO COLLEGE OF DENTAL SURGERY ALUMNI HOMECOMING

The Chicago College of Dental Surgery, Dental School of Loyola University, will hold its 67th annual alumni homecoming clinics and banquet April 17 and 18 at the Bismarck Hotel, Chicago.

The banquet will be held in the Walnut Room on the evening of the 17th. Tickets may be purchased at the door or from Michael D. Rose, banquet chairman. The cocktail hour will begin at 6:30 P.M., with dinner being served thereafter.

The homecoming clinics will be conducted at the college on the 18th.

PERCY R. HOWE PASSES AWAY IN MASSACHUSETTS HOME

Percy R. Howe

Percy Rogers Howe, director of the Forsyth Dental Infirmary for Children in Boston, and a pioneer in research on the effect of diet on teeth, died February 28 in his Belmont, Mass., home at the age of 85.

Born in Providence, R. I., Dr. Howe was graduated from Bates College and received his dental degree in 1889 from the Philadelphia Dental College. He practiced for several years in Lewiston and Auburn, Me., before going to Boston in 1898. When the Forsyth infirmary was dedicated in 1914 as the first institution of its kind, Dr. Howe was appointed head of its research laboratory. He was made director of the infirmary in 1917.

Dr. Howe was one of three persons to receive the A.D.A.'s Award of Merit and Achievement four years ago for his work on the effect of vitamin deficiencies on the teeth. In 1948 he was made a Fellow in Dental Surgery of the Royal College of Surgeons in England, in recognition of his work.

Dr. Howe was a former president of the A.D.A., and held membership in the Federation Dentaire Internationale, Academie Internacional de Odontologia and numerous other professional societies.

Surviving are his widow, Mrs. Ruth W. Howe, and a son by a former marriage, James Albert Howe of Greenwich, Conn. His first wife, the former Rose Alma Hilton, died in 1942.

WILL G. SHEFFER PASSES AWAY IN CALIFORNIA

Will G. Sheffer, president-elect of the California State Dental Association, died suddenly on February 15 at his home in San Jose, Calif. He would have succeeded to the chair of president on April 27.

Dr. Sheffer was born in Colorado Springs, Colo., in 1892, and was attending Williams College in Chicago when he enlisted in World War I. Following his discharge he studied roentgenology at the University of California, and after working as a technician in St. Luke's Hospital, San Francisco, he re-entered U.S.C. to earn his D.D.S. degree in 1923.

At the time of his death, Dr. Sheffer was practicing orthodontics and was past president of the Pacific Coast Society of Orthodontics. He was a member of the American Dental Association, the California State Dental Association, Santa Clara District Dental Society and was active in several civic and service clubs.

Dr. Sheffer is survived by his widow, the former Natalie Gray, two daughters and three grandchildren.

ENDODONTISTS MEET IN CHICAGO FOR ELECTION OF OFFICERS

The American Association of Endodontists held their annual meeting and program at the Stevens Hotel in Chicago, February 4 and 5, with E. A. Jasper, of St. Louis, presiding.

At the conclusion of the meeting, Dr. Jasper turned the gavel over to the new president, Raymond L. Girardot, of Detroit, and announced the newly-elected officers of the Association. The president-elect is George C. Sharp, Pasadena, Calif.; vice-president, F. D. Ostrander, Ann Arbor, Mich.; secretary, N. W. Burkman, Birmingham, Mich., and treasurer, V. B. Milas, Chicago.

The newly-appointed executive committee is composed of George C. Hare, Toronto; Erwin A. Epstein, St. Paul, and Thomas C. Starshak, Chicago.

INDUSTRIAL DENTISTS TO MEET IN CHICAGO APRIL 25-27

The American Association of Industrial Dentists will meet at the Sherman Hotel, Chicago, on April 25, 26, and 27, according to an announcement by F. J. Walters, secretary of the association.

The meeting will be held in conjunction with four allied groups: American Conference on Governmental Industrial Hygienists, American Industrial Hygiene Association, American Association of Industrial Physicians and Surgeons and the American Association of Industrial Nurses.

EXAMINATION FOR ASSISTANTS IN KANSAS CITY, MAY 7

Miss Opal Joerger, Secretary of the Kansas State Dental Assistants Association, has announced that examinations for the 104 hour certification course for Kansas and Missouri dental assistants will be held on Sunday, May 7. The tests will be conducted at the Kansas City Western Dental College, Kansas City, Mo.

WASHINGTON UNIVERSITY DENTAL ALUMNI TO MEET IN ST. LOUIS

Washington University dental alumni will hold their annual meeting April 14 and 15, at the Washington University Dental School, St. Louis, according to an announcement by V. P. Thompson, secretary-treasurer of the group.

Further information may be obtained by writing to Dr. Thompson at 234 West Lockwood Ave., Webster Groves 19, Mo.

BOOK REVIEWS

Blakiston's New Gould Medical Dictionary. Edited by Harold Wellington Jones, M.D.; Normand L. Hoerr, M.D., and Arthur Osol, Ph. D. First edition. 1,294 pages, with 252 illustrations, 129 in color. Price textbook, flexible or rigid binding, $8.50; thin paper, flexible or rigid binding, $10.75; de luxe thin paper, flexible binding, boxed, $13.50. Philadelphia: The Blakiston Company, 1949.

An elderly, isolated couple had four books, one of them a dictionary. They read and reread three of them aloud many times during their long winter evenings before they tackled the reputedly dry sport of reading the dictionary. When they did get at the dictionary they found some strange and wonderful things.

Probably few of us would care to consider such a project. However, just such an undertaking was the first step in over five years of research that produced the book considered here. The chief editor, Dr. Jones, formerly librarian of the Army Medical Library, first read through the entire *Gould Medical Dictionary*, fifth edition, and marked some twenty per cent of the words for deletion as being archaic or bad terminology. These words were then carefully considered by an editorial board, and the literature for the last twenty-five years was examined to see whether they had appeared during that time, before they were finally rejected or included. Then followed the examination of over 300 standard modern textbooks and the indexes and yearbooks of many specialties for new words and usage. Eighty prominent contributors, including two dentists, cooperated in this work to produce the first completely new medical dictionary in 38 years. It contains 81,000 entries including modern developments in atomic research, drugs and vitamins, and military medicine. Specialists in the various fields wrote the definitions, many of which are so marked, as "in dentistry," "in psychoanalysis." The dentist, however, should not expect that with this book in hand he can dispense with a dictionary of dental terms also. He will find pulpotomy, but not pulpectomy, and some of the older terms such as dummy, pivot, pivot clack, and pivoting, but not always a newer term such as mucostatics. And he may not find the definitions inclusive enough. For example, "sprue" is well-defined as a disease, but there is nothing to indicate that it is also a thin wire or other material used to produce a vent in a mold for casting. This should be expected in a book of manageable bulk which claims to be "a modern comprehensive dictionary of the terms used in all branches of medicine and allied sciences, including medical physics and chemistry, dentistry, pharmacy, nursing, veterinary medicine, zoology and botany, as well as medicolegal terms."

The fine illustrations are grouped in one section, and contain Schour and Massler's "Development of Human Dentition."

Through the use of bold face type and excellent composition the user's task is simplified. Each entry stands out clearly, a pleasant contrast to the frequently cluttered, crowded appearance of dictionary pages. Pronunciation is shown by syllable division and accent, and, whenever necessary, by phonetic respelling based on familiar, conventional orthography. The characters in Greek root words have been transliterated into Roman in deference to the prevailing unfamiliarity with Greek.

This excellent reference work concludes with 133 pages of tables including anatomic, dietetic, prescription writing, vitamin, and weights and measures.—*Donald A. Washburn.*

Die Durchbruchstörungen der Weisheitszähne. (Klinic und Therapie.) By Herbert Harnisch. Second edition. 92 pages. Illustrated. Paper bound. Price DM 5. Jena: Gustav Fischer, 1949.

The present monograph dealing with the complications following the retention, impaction and half impaction of the third molars is based on a rich surgical experience and on a review of the German literature on this subject. The English, French, and Italian literature is covered only from abstracts in German language.

The author discusses in detail the different theories for the retention and impaction of the lower third molar. He considers the following theory the most probable. By mutation a reduction of the jaws and teeth developed. Both phenomena might have occurred simul-

taneously; however, the reduction of the jaws might have progressed more rapidly. In addition the author assumes that while the size of the teeth is only genetically determined and independent of function, the size of the jaws is dependent on both of these factors. If through lack of muscular function the jaws do not develop optimally, a disharmony is created between the size of jaws and teeth, leading to retention and impaction of teeth.

The greater part of the monograph deals with the clinical picture of impaired third molar eruption. The disease entity is characterized by edematous swelling of the gingiva and the mucous membrane of the cheek, impairment of the opening of the mouth, lymphadenitis and pain. Sometimes swallowing is painful and rise in temperature is experienced. Through the difficulty in opening the mouth and through lack of cleaning the teeth, the inflammation might spread from the region of the third molar to other parts of the gingiva and halitosis might result.

The author divides the course of the disease into three stages. Stage one is characterized by inflammation of the gingiva distally and buccally to the wisdom tooth. Subjective complaints are slight.

Stage two is most frequently observed. The patient already had pains for 4 to 5 days, slight increase in body temperature and the opening of the mouth is impaired. The tooth is almost completely covered by the inflamed gingiva.

The third stage is characterized by the severity of all the symptoms, especially difficulties in swallowing. All stages are illustrated by case histories, roentgenograms, diagrammatic drawings and microphotographs of the diseased areas.

The monograph will be of interest to oral surgeons and pathologists who do not fall into the same mistake as the author, that is, only consult the literature of their own language.—*Joseph P. Weinmann.*

Oral Histology and Embryology. By Frederick Noyes, Isaac Schour and Harold J. Noyes. Sixth edition. 443 pages with 284 illustrations and 15 plates, 11 in color. Index. Price $7.50. Philadelphia: Lea and Febiger, 1948.

This text, now revised in its sixth edition by two of the original three authors, has been widely used in the past. The single volume is again divided into two parts and thus made to serve two purposes. Part I consists of a wide survey of oral histology and embryology, while Part II contains a detailed approach to laboratory study of these subjects.

Review of the text brings to light certain of its features which are deserving of criticism. One is struck by the breadth of coverage attempted. The subjects of dental caries and comparative dental histology, for instance, would seem to be unwisely placed here. Moreover, considering the background possessed by the students who will use this book, one questions both the inclusion of general reviews of bone and periosteum (Chapters 14 and 15) and the elementary approach to several of the basic subdivisions of oral histology. Among the subjects which deserve greater mention than is given them are root formation, origin and structure of gingival crevice and epithelial attachment and histological characteristics of the maxillary sinus and nasal cavity proper.

Bibliographies do not in all cases give reference to the names of men quoted within the body of the chapter, nor do they consistently refer a student to the latest investigations.

Apart altogether from the advisability of including Part II in the text, it can be said that the directions for laboratory work do have real value. Excellent comment is made upon the purpose of laboratory drawings. Unfortunately, two contradictory thoughts are expressed on page 398. One statement maintains that "outlines are by far the most important stage in the drawings," while later on the same page there is expressed the viewpoint that "prime requisites in a laboratory drawing are accuracy and correctness of detail." With time allotments to the oral histology course being what they are, this latter statement and the subsequent stress upon ground section preparation by students seem questionable. On the other hand, the emphasis placed upon the study of embryonic growth is well justified.

To speak of the excellence of the color plates is merely to indicate the high quality of the illustrations in general. A balance between line-drawing, photograph and photomicrograph has been, for the most part, well maintained. Inclusion of cephalometric roentgenograms in Chapter 18 is a step forward. The authors, too, have provided an unusually fine description of the lymphatic supply to the entire dental region. Their paragraphs upon

the lymphatics of the pulp and periodontal membrane fill a gap which is conspicuous in other texts. These are some of the strong and positive features of the book which should guarantee its continued usage.—*Alfred Ogilvie.*

School Health Education. By Delbert Oberteuffer, Ph.D. First edition. 405 pages. Index. Price $3.25. New York: Harper & Brothers, 1949.

"There is a reciprocal relationship possible between the school health program and private physicians, dentists and medical and dental societies. Fully developed, such a relationship would enhance the position and program of all concerned." This sentence is a clarion call to the dental profession to study school health policies and procedures and to share with school administrators their efforts in public health education. Dr. Oberteuffer's textbook, "School Health Education," will provide pertinent information concerning "foundations of school health education of curriculum and teaching for health education and the administration of school health programs."

The author suggests sound policies for public dental programs. "No school," says Dr. Oberteuffer, "should attempt to work out a dental program without assistance from the local or state dental societies. Regardless of the extent to which dental services are rendered in schools, there are certain basic tenets of administration which, if followed, will make for effective programs." He lists these as follows:

1. Services of dentists and dental hygienists should be paid for.
2. Local funds should be used in support of the program but where they are not available, state or federal subsidies may be sought.
3. School programs should be aimed to give as much service as possible in the primary years.
4. The teacher is the central figure in any program of dental health education.
5. The dental hygienist is available in demonstrating prophylaxis for younger children.
6. The public health or school nurse has important opportunities in a dental health program.
7. It seems to be an unanswered question whether the original dental examinations should be made in the offices of private dentists or at public clinics or at school by visiting dentists.

Dentists interested in patient education will read that "healthful behaviour is the principal thing to be sought in health instruction, that anatomical detail is useful only in explanation." A teaching outline on teeth is given on page 169 to show an example of an anatomical approach concerning which the author expresses disapproval. Dr. Oberteuffer does not believe that health in itself is a good motivating factor. Health, he advises, should be presented as a means to the end rather than as an end.

Members of dental society councils on dental health will find comprehensive discussions of programs utilizing direct teaching, programs of correlation and programs of integration in this volume worthy of recommendation.—*J. Wisan.*

Physical Properties of Dental Materials. By Wilmer Souder and George C. Paffenbarger. National Bureau of Standards Circular C433, Division of Language Services of the Department of State.

Already the interest shown in the translation in the other American republics, where it is being distributed as part of the program of the Interdepartmental Committee on Scientific and Cultural Cooperation, is so great that approximately 1,800 of the 3,000 copies printed have been distributed. The translated edition follows the original English, except for the addition of a chapter on "Preparation and Characteristics of Elastic Dental Impression Compounds with an Alginate Base," by I. S. Schoonover and George Dickson, also of the National Bureau of Standards.

Entitled in Spanish *Propiedades Físicas de los Materiales Dentales,* the pamphlet is the Division of Languages Service's publication No. TC-253. The text has 303 pages introduced by forewords prepared by the National Bureau of Standards and the American Dental Association.

The American Dental Association was consulted at the time the translation of the publication was under consideration and gave its hearty endorsement to the project.—*C. B. Hall.*

COUNCIL ON DENTAL THERAPEUTICS

REVISED PROCEDURE FOR THE EVALUATION OF DENTAL PRODUCTS

A REVISION of the procedure for the evaluation of dental products by the Council on Dental Therapeutics was prepared by the Council and adopted by the Board of Trustees at its February, 1950 session. The following report explains the changes in the Council's program.

Objectives and Philosophy of Council's Program

The controlling objective in the program of the Council on Dental Therapeutics must always be the protection of the health of the public. This is attained most effectively through the efforts to make available to the dentist a wide variety of safe, reliable products. This objective also involves a careful appraisal of the items which are sold to the public for dental use. Governmental agencies, notably the Food and Drug Administration and the Federal Trade Commission, have made outstanding contributions to the safety and reliability of dental products designed for professional and public use. Such agencies, however, cannot provide and are not intended to provide many services which can be obtained from the Council on Dental Therapeutics. Limitations on the disclosure of certain information, restricted personnel, together with the multiplicity of urgent non-dental problems and the limitations in authority provided by law are some of the factors which restrict the activities of the governmental bodies. It should also be noted that authoritative statements by nonofficial groups such as the Council on Dental Therapeutics are often helpful to governmental agencies.

The Council on Dental Therapeutics, as a part of a democratic organization, does not attempt to impose its decisions upon the members of the profession. It acts as an evaluating and informing agency and stands ready to serve in an advisory capacity or in cooperation with other departments of the Association or of other organizations with similar professional ideals.

The Council's decisions on dental products are based upon the currently available scientific evidence and are subject to reconsideration whenever a substantial amount of new evidence becomes available. A difficult problem which confronts the Council member is the collection and sifting of this evidence. Published data must be compiled not only from the dental literature but also from journals in the related fields of bacteriology, pharmacology, general medicine and the medical specialties. Information obtained in the commercial laboratories is received and considered. Firms are encouraged to support disinterested and unrestricted clinical studies in dental schools and other reliable and adequately equipped institutions. In some instances a consultant or referee may perform some tests. In other cases, the Council may be authorized to support a limited

amount of additional research. Evidence obtained in private practice is helpful but it is collected slowly and it is especially difficult to evaluate because of the obvious limitation in the provision of controls. Assistance in the compilation of data is provided by the Council office and it is planned to expand this activity as much as possible. Firms are required to furnish bibliographies but these must be checked for completeness.

A discussion of the problem of assessing the accuracy or value of published data is beyond the scope of this report, but reference to the time-consuming nature of the process is relevant to a description of the referee system. Since it is patently impossible for all members of the Council to make exhaustive studies of all types of products, the initial consideration is ordinarily assigned to a referee. This individual becomes responsible for the compilation and analysis of the data, for the preparation of a detailed report to the Council and for a recommendation for Council action. This report is circulated to the Council and an opportunity is provided for each member to study the report and offer suggestions before a vote is taken. The Council believes that this system of evaluating products is basically sound in that it provides detailed study of the data by one or more individuals in addition to the consideration by the Council as a group.

Special attention has been directed to the establishment of a new method for the classification of products. The accepted (Group A) and unacceptable (Group D) categories have been maintained as in the past. In addition there are two groups of products which are unaccepted but not declared unacceptable. Group B products are those that merit promotion for special use and study. Since Group B products are not included in *Accepted Dental Remedies* and do not carry the Seal of Acceptance or any designation of acceptance, there is less danger that they will be confused with accepted products. Classification in Group B or C will be similar to the issuance of a status report but this classification will provide a more definite opinion of the product's probable usefulness as judged by the preliminary evidence.

The general and special provisions for the acceptance of products have been reduced to the minimum that is essential to the success of the acceptance program. Any firm should understand clearly what the Council requires and why these requirements have been established.

Complete information on the composition of drugs is obviously necessary for Council consideration and for proper use of the agent by the dentist. The Council requirement in this matter is in conformity with the attitude expressed in Section 8 of the *Principles of Ethics of the Association*.

The determination of the proper requirements in the naming of products has been a difficult problem but there is at present a rather general agreement in the professions and the trade with respect to certain principles. The Council requirements flow naturally from the basic assumption that the dentist should not be expected to remember a long list of names for products which may be essentially identical. However, the Council recognizes the legitimate desire of the firm to identify its product by the proper use of brand names. A suitable brand name is acceptable if it does not obscure the common name of the drug. The Council also stresses the idea that a name should provide information concerning the composition of a product. All proper efforts to facilitate the dentist's recognition of the true nature of a product are desirable. Any attempt to apply a name which suggests a disease is regarded as an attempt to usurp the responsibility of the dentist who is trained to use the drug in a rational and critical rather than an empirical manner.

The Council's consideration of advertising is directed toward the claims which

may be properly used in marketing products which are listed in Group A or Group B. The purpose of this consideration is to prevent the dissemination of misinformation and to prevent the misuse of this classification for the promotion of an item by the use of claims which cannot be substantiated.

PROVISIONS FOR ACCEPTANCE OF PRODUCTS BY THE COUNCIL ON DENTAL THERAPEUTICS OF THE AMERICAN DENTAL ASSOCIATION

Preface

Purpose of the Council.—The Council on Dental Therapeutics gathers and disseminates information to assist the dental profession in the selection and use of therapeutic agents and their adjuncts and dental cosmetic agents.

Commercial products are examined either upon the request of the manufacturer or distributor or upon the initiative of the Council. Any firm may submit its appropriate products to the Council for consideration for acceptance. Products will be listed in *Accepted Dental Remedies* and described in suitable reports in THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION if they meet standards of acceptance with respect to usefulness, composition, advertising and labeling. Products are usually accepted for three years. Acceptance is renewable and may be reconsidered at any time. If ownership of the product changes, the period of acceptance expires automatically. Products which are obsolete, markedly inferior, useless or dangerous to the health of the user will be declared unacceptable. When it is in the best interest of the public or the profession, the Council may submit reports on unacceptable products to the Editor for publication in THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION.

The Council is under obligation to provide the profession with prompt, reliable information on the status of recently developed dental products. In evaluating new items, special emphasis is placed on consideration of evidence of safety under the conditions of use. Decisions of the Council are based upon the available scientific evidence and are subject to reconsideration at any time that a substantial amount of new evidence becomes available.

The Bureau of Chemistry of the American Dental Association cooperates with the Council in the development and maintenance of standards of composition of dental products.

The Council encourages research in the field of dental therapeutics.

Communications with the Council shall be in writing and shall be transmitted through the Secretary of the Council. The Council will feel free to use the information in these communications.

Articles Considered for Acceptance.—Under the Bylaws of the American Dental Association, the Council on Dental Therapeutics is directed "to study, evaluate and disseminate information with regard to dental therapeutic agents, their adjuncts and dental cosmetic agents which are offered to the public or to the profession."

Consideration of prosthetic and restorative materials is specifically assigned to the Council on Dental Research of the American Dental Association. When these materials possess therapeutic properties or claims for such properties are made, they are considered cooperatively by the two councils. The Council on Dental Therapeutics stands ready at all times to assist or advise other councils or commit-

tees of the American Dental Association on matters which pertain to dental therapeutics. Generally included within the responsibility of the Council on Dental Therapeutics are all drugs, chemicals and devices which are employed in the diagnosis, treatment or prevention of dental disease. Drugs are considered useful in the treatment of oral disease if they are effective in treatment of disease of similar causation in other regions of the body. Mixtures are considered for acceptance if all of the ingredients are necessary to therapeutic action or pharmaceutical quality. Other mixtures which have established usefulness in dental practice are considered for acceptance if they meet reasonable standards of safety and claims are not made for ingredients which are therapeutically inactive.

Classification of Products Evaluated by the Council.—After consideration of a product has been completed, the Council will classify the product in group A, B, C or D.

At the present time the Council does not consider for evaluation (1) mouth washes or dentifrices which do not claim therapeutic value, (2) toothbrushes, (3) cleansers for artificial dentures, (4) preparations which are not related to the treatment of oral diseases, such as cathartics and diuretics, and (5) sterilizers which employ steam or boiling water as the bactericidal agent.

Group A consists of accepted products which will be listed in *Accepted Dental Remedies* and may use the Seal of Acceptance, unless otherwise provided.

Group B consists of products which lack sufficient evidence to justify present acceptance, but for which there is reasonable evidence of usefulness and of safety. These products meet the other qualifications and standards established by the Council on Dental Therapeutics and the Bureau of Chemistry. It is the Council's opinion that Group B products may be promoted for special use and study.

Group C consists of products for which the evidence is so limited or inconclusive that the products can not be accurately evaluated. It is the Council's opinion that Group C products require further study by qualified investigators.

Group D consists of products which are unacceptable because of their demonstrated inability to meet the standards outlined in the provisions for acceptance.

General Provisions for Acceptance

I. ***Composition or Design***

A. *Drugs*

1. *Single Substances.*—The chemical formula and properties shall be known and available for publication.
2. *Mixtures.*—The quantitative formulation of drug and chemical mixtures shall be known and available for publication. Exact quantities of individual flavors need not be stated and the nature of flavors and colors which are ingredients of preparations certified by any federal agency need not be revealed.

B. *Devices.*—A description of the construction and method of operation shall be provided.

C. *Change in Composition or Design.*—The firm shall agree to notify the Council of any change in composition or design of an accepted product before the modified product is marketed.

D. *Manufacturing Standards.*—The firm shall provide evidence that the manufacturing and laboratory control facilities are under the supervision of qualified personnel, and are adequate to assure purity and uniformity of products and accuracy of labeling. Representatives of the Council and the Bureau of Chemistry of the American Dental Association may visit factories and laboratories, but will not assume any responsibility for the operation of these facilities.

E. *Standards or Specifications of the Bureau of Chemistry.*—Drugs and devices shall conform to standards or specifications of the Bureau of Chemistry of the American Dental Association.

II. ***Name***

A. *Trade Names.*—The Council may require the firm to provide a satisfactory descriptive name when the trade name for a product does not adequately describe the nature of the product.

1. *Brand Name.*—The common name of the product shall not be subordinated to the brand name on the label.
2. *Exclusive Trade Names.*—Exclusive trade names shall not be used for preparations which are included in the *U. S. Pharmacopoeia* or the *National Formulary* unless the name was

in public use before the drug was admitted to an official compendium.

3. *Misleading Names.* — Names which are misleading or which suggest diseases or symptoms are not accepted. This provision does not apply to biologic products, such as serums, vaccines or antitoxins.
4. *Numbers or Initials as Names.*—The product name shall not consist of numerals or initials. This provision does not apply to conventional price lists or catalogs, or to proper use of serial or code numbers.
5. *Titles in Names.* — Titles such as "Doctor" or "Dentist" or the designation "D.D.S." or "D.M.D." shall not be included in the name of a product.

B. *Common or Generic Names of Separate Compounds*

1. *Salts.*—Coined names for salts shall indicate the components of the salt whenever it is practicable.
2. *Other Compounds.*—Coined names shall suggest the composition of the product whenever it is practicable.

C. *Names of Mixtures.*—The name shall indicate the therapeutically active ingredients of mixtures whenever it is practicable.

III. ***Evidence of Usefulness and Safety***

A. *Submission of Evidence.*—Evidence pertaining to properties, actions, dosage, usefulness and safety shall be submitted by the firm.

B. *Nature of Evidence.* — The firm shall provide objective data with citation of sources. Extended clinical experience may be utilized as a basis for evaluation of a product.

IV. ***Government Regulations.*** — Products shall conform to all applicable laws and governmental regulations.

V. ***Advertising***

A. *Claims.*—Claims made for products in labels, labeling, advertising or by any other means shall be clear and accurate.

B. *Lay Advertising.*—Lay advertising, including counter and window displays, for products which are accepted shall not include any mention of their accepted status.

C. *Implied Acceptance.* — Accepted products shall not be advertised or displayed with unaccepted products in a manner that implies acceptance of the unaccepted products. This provision does not apply to conventional price lists or catalogs.

VI. ***Seal of Acceptance***

A. The Seal of Acceptance, except as otherwise provided, may be used after acceptance of the product has been announced in THE JOURNAL; or at the discretion of the Council. The Seal shall not appear in conjunction with the seal of any other investigative group unless approval for such display has been obtained from the Council. The Seal is to be used without comment on its significance unless such comment has been previously approved by the Council. The Seal of Acceptance shall be legible and shall not be used in any manner which detracts from its dignity.

B. In the event that a product is deleted from *Accepted Dental Remedies,* all use of the Seal of Acceptance in connection with the product must be discontinued within six months of the date of notification of the firm by the Council.

VII. ***Changes in Provisions.***—Any amendment to these provisions which may be made after acceptance of a product shall not apply to such product until the current period of acceptance has terminated. At the end of this period, the product must comply with the amended provisions if acceptance is to be renewed.

(Note: As indicated in the preface, acceptance may be terminated at any time that a substantial amount of new evidence becomes available to disclose undesirable qualities that were not apparent at the time of acceptance of the product.)

Provisions for Acceptance in Special Categories

Products which come within the following categories, in order to be acceptable, must also meet the following special provisions.

I. ***Products Bearing the Prescription Legend.***—The legal right of the dentist to prescribe these items shall be recognized by the inclusion of the word "dentist" in the caution statement as provided by the regulations issued

for the administration of Section 502 (f) (1) of the Federal Food, Drug, and Cosmetic Act. (See Federal Food, Drug, and Cosmetic Act and General Regulations for Its Enforcement. Section 502 (f) (1). p. 28 S.R.A., F.D.C.-1, Rev. 3, issued March, 1949.)

II. *Mixtures*

A. *Active Constituents.*—Separate consideration may be required for any single active constituent which is not listed in *Accepted Dental Remedies.* Nonofficial constituents for which germicidal claims are made, and certain abrasives, are given separate consideration routinely.

B. *Labels.*—The labels of an accepted mixture shall bear a statement of the amount of each therapeutically active ingredient in a stated quantity of product. This latter provision shall not apply if adequate information concerning the quantitative composition of the mixture is otherwise given to the dental profession.

III. *Chemicals Proposed for Disinfection of Instruments*

A. The products must be effective in killing vegetative forms of pathogenic organisms (except possibly Mycobacterium tuberculosis) within five minutes.

B. Labels, package inserts and advertising for such products should emphasize:

1. The necessity for adequate physical cleansing of the instruments prior to disinfection.
2. The necessity for an adequate period of contact of the instruments with the disinfecting agent in a suitable container.
3. The necessity for periodic replacement of the disinfecting agent.
4. The inability of the product to disinfect hinged instruments, those with deep narrow crevices and hypodermic needles.
5. The inability of the product to kill spores and Mycobacterium tuberculosis.

C. Labels, package inserts and advertising for such products shall not include the term "sterilizing" or "sterilizing solution."

IV. *Denture Adhesive Powders*

A. *Samples.*—Samples shall not be distributed to persons other than dentists. Samples shall not be supplied to any mail-order denture house or dental laboratory.

B. *Package Statement.*—The following statement shall appear on every trade package: "Ill-fitting dental appliances may impair health—consult your dentist for periodic examination." The Council will give consideration to alternative statements designed to convey the same meaning.

V. *Local Anesthetic Solutions for Injection*

A. *Specification.*—These products shall conform to the specification adopted by the Council on Dental Therapeutics (J.A.D.A. 38:268-9 [Feb.] 1949.)

B. *Warning Statements*

1. The following warning statement or its equivalent must appear on each package of solutions containing a concentration of anesthetic agent which is more toxic than 2 per cent procaine: "The concentration of anesthetic agent in this product is greater than that required for routine dental use. Use only where anesthesia is difficult to obtain."
2. The following warning statement or its equivalent must appear on each package of solutions containing a higher concentration of epinephrine than 1:50,000 or its equivalent in other vasoconstrictors: "The concentration of vascoconstrictor in this product is greater than that required for routine dental use. Use cautiously."

VI. *Analgesics*

A. *Composition.*—Pharmaceutical preparations which consist of acetylsalicylic acid or mixture of acetylsalicylic acid, acetophenetidin and caffeine, with or without codeine, will be considered for acceptance, provided:

1. The total weight of active ingredients shall not exceed 0.5 gram per dosage unit.
2. The quantity of acetophenetidin shall not exceed 0.2 gram per dosage unit.

B. *Advertising*

1. The quantitative composition of the product shall be stated in all ad-

vertisements to dentists.

2. Advertisements to the public shall not include misleading or unwarranted statements.
3. Advertisements to the public, labels or labeling shall not include the Seal of Acceptance or any reference to the American Dental Association or its Council on Dental Therapeutics.

VII. *Devices for Interproximal Gingival Massage*

A. The devices shall be advertised only to dentists.

B. Claims shall be limited to usefulness under professional supervision as an adjunct to professional treatment.

COUNCIL ON LEGISLATION

AN ANALYSIS OF SENATOR HUNT'S HEALTH INSURANCE BILL (S. 2490)

On January 30 Sen. Lester C. Hunt (D., Wyo.), a member of the American Dental Association, introduced a new bill, S. 2490. Considerable discussion of Senator Hunt's bill has appeared in the public press and in some professional journals. This article analyzes the proposals contained in that bill.

While the bill provides for a system of voluntary health insurance as distinct from the compulsory health insurance bill sponsored by the Administration, the position of the American Dental Association with regard to the actual text has not as yet been determined.

The proposals contained in the bill are presently being studied by the Council on Legislation and other councils. It will be noticed from the following analysis that some of the proposals are unique and that others are an adaptation of bills already introduced by other members of Congress.

Senator Hunt has offered this bill as a possible answer to the Administration's compulsory health insurance program with a view to stimulating discussion and to encouraging the health professions to formulate legislative proposals of their own which will provide a satisfactory answer to the health problems of the country. The bill is divided into four titles.

Title I proposes to establish a Department of Health under a Secretary who would be a professional health worker, either a physician or a dentist, with broad experience in the field of medical or dental education and who has never held office in a political party organization. The qualifications for the Under-secretary would be similar. The title likewise provides for five Assistant Secretaries, four of whom would head bureaus relating to health, and the fifth of whom would head a Bureau of Staff Services. The bill would create a special Advisory Board consisting of the Chief of the Office of Medical Services in the Department of Defense, the Federal Security Administrator, the Administrator of Children's Affairs, or their representatives. (Note: the bill probably should name the Secretary of Defense rather than Chief of the Office of Medical Services as a member of the Board.)

The bureaus proposed to be created are Medical and Hospital Care, Public Health Practice, Children's Health, Research, and Staff Services. Eighteen objectives are set forth for the new Department including support of the improved health of the American people; cooperation in international health problems; the administration of grants-in-aid; construction and research programs; provision of consultation and personal services;

promotion of adequate local public health, medical, and hospital care services; administration of the insurance program set up by the bill; improved planning and operation of Federal hospitals and the services therein; and various other objectives along this line.

The following activities would be transferred from other agencies to the Department of Health: all health functions of (a) the Children's Bureau, (b) the Social Security Administration, (c) the Office of Vocational Rehabilitation, (d) civilian hospitals, dispensaries, etc. under the jurisdiction of the Panama Canal Zone, The Public Health Service and the Food and Drug Administration.

Provision is made for the transfer to the Secretary of Health of all functions of the top agency heads with respect to the transferred functions and of all funds appropriated for the purposes of the transferred agencies.

The bill proposes a non-partisan presidential commission to study military and VA hospital programs; the Director of the Bureau of the Budget and the Secretary are to study the operation of St. Elizabeth's Hospital in Washington with a view to division of responsibility between the District of Columbia and the Federal Government.

The Secretary, the Director of the Bureau of the Budget, and the Civil Service Commission are directed to make a joint study of the personnel needs of the new Department and to recommend a career system based upon the needs of professional workers in the Department. Employees transferred to the new Department would have the option of retaining either their civil service status or their semi-military Public Health Service status or to participate in the new career system at their option. New employees would be required to be appointed within the new system.

Title II with certain modifications, necessary to take care of the difference between the two bills, is substantially identical to Title IV of the Wagner-Murray-Dingell bill in that it is designed to provide funds for the making of grants or loans for the construction of hospitals, health centers and the like, both in conjunction with, and outside of, the provisions of the Hill-Burton Act and in that it would provide loans and other inducements to individual practitioners to locate and remain in rural and shortage areas. It is further similar in that it provides special grants for farmers' cooperatives to initiate and carry out experimental plans for providing comprehensive medical care to their members. Within the definition of medical care, dental care is authorized at the option of the cooperatives. A total sum of $70,000,000 over a period of five years is authorized for the cooperative part of the program and appropriations of $140,000,000 within four years for the grants and loans authorized for facilities in shortage areas.

This title of the bill authorizes guarantees of minimum gross or net incomes, or of payments to meet operating expenses, if qualified professional and technical health personnel will locate in areas determined to be shortage areas. The assistance to cooperatives is limited by definition to rural areas which do not contain and are not adjacent to any city or town having a population of 10,000 or more.

Title III. This title proposes to set up a voluntary insurance scheme to provide health services to individuals whose aggregate gross income does not exceed $5,000 per annum. A National Health Insurance Board of five members is created to administer the insurance provisions. The Surgeon General of the Public Health Service would be chairman. One member would be a representative of hospital associations, one of dental associations, and two are to represent the public at large and may not be professional health workers.

The following services may be provided as benefits to insured individuals: medical, dental, home nursing, hospital, and auxiliary services. Medical or dental services may be rendered at the office, home, hospital, or elsewhere as is necessary. Medical services are to consist of such general medical and surgical services as are usually rendered by a physician engaged in the general or family practice of medicine, including preventive, diagnostic, and therapeutic care, and periodical medical examinations.

Dental services are to consist of general dental services rendered by a dentist engaged in the general practice of dentistry, including preventive, diagnostic, and the therapeutic care, and periodical dental examinations.

Specialist services, either medical or dental, are those rendered by a person who is a specialist in the class of service rendered.

Home nursing services are nursing care of the sick rendered in the home by a registered or qualified practical nurse.

Hospital services may include nursing, physicians, laboratory, and ambulance services and

may be provided for a maximum of 60 days in any benefit year. Mental, nervous, or tubercular diseases are generally excluded from hospitalization benefits.

Auxiliary services would consist of chemical, bacteriological, pathological, diagnostic, X-ray, radium, and related therapy; physio-therapy; optometrist services; unusually expensive prescribed drugs, special appliances; and eye glasses.

The Board is authorized by regulation to limit for a specified period the benefits to be provided if personnel, facilities, or funds are inadequate. Dental services for children may be given priority in Board regulations.

Insurance of an individual automatically covers his dependents. Dependents are broadly defined to include the direct ancestors and descendants of the insured, his collateral relatives, whether of the half blood or whole blood or whether legally adopted, to the third degree of kindred under the rules of the Civil law and his relatives by affinity directly connected, a son-, daughter-, father-, mother-, brother-, or sister-in-law.

Payments are to be made from the Personal Health Insurance Account created by the bill, but no payment shall be made upon any insurance during a period of 12 months except for amounts payable in excess of $5 with respect to all beneficiaries under the policy.

There are no specific provisions incorporated into the Act with regard to the form of the policy nor the amount of premiums to be charged. A Personal Health Insurance Account is created on the books of the Treasury, into which premiums received are to be paid and appropriations from Federal funds of such additional amounts as may be necessary to carry out the provisions of the title are authorized.

Insured individuals are to have free choice of physician, dentist, nurse, medical group, hospital, or other group to render such services as may be available under the Act. It is interesting to note that the same prerogative is not reserved to practitioners.

The Board is to have broad general powers to administer, execute, and enforce the provisions of the title under the general direction of the Secretary of Health. The decisions of the Board are to be final on all questions of law and fact except where a judicial review through the Federal court system is sought. For the purpose of judicial review, jurisdiction is conferred upon the U.S. District Court of the District of Columbia and upon the District Court of the United States in and for the district in which an agreed eligible beneficiary resides.

The Act contains penalty provisions with regard to fraudulent claims. It is to take effect 30 days after the date of its enactment. Nothing is specified in the bill with regard to participating practitioners, this apparently being left to the Board's discretion.

COUNCIL ON DENTAL EDUCATION

DENTAL INTERNSHIP AND RESIDENCY PROGRAM APPROVED AND DENTAL HYGIENISTS' EDUCATION STUDIED

Internship and Residency Programs

At the meeting of the Council on Dental Education on February 3, the following internship and residency programs were approved. The Council on Dental Education also decided that its approval of internship and residency programs would now specify not only the type of program but also the area or areas in which the education program has been approved. Additions or changes to these programs should be brought to the attention of the Council by the hospital.

Areas Covered—Internship and Residency Programs

Philadelphia General Hospital
34th Street and Curie Avenue
Philadelphia 4, Pennsylvania

Internship—Mixed or Rotating	Residency—Straight
Oral Surgery	Oral Surgery
Children's Dentistry	
Anesthesia	
Oral Pathology	
Prosthodontia	
Periodontia	
Endodontia	
Radiology	
Laboratory	

U. S. Marine Hospital
Fairhill Road and East 24th Street
Cleveland 20, Ohio

Internship—Mixed or Rotating
Oral Surgery
Children's Dentistry
Anesthesia
Oral Pathology
Prosthodontia
Periodontia
Endodontia
Radiology

U. S. Naval Hospital
7th and Bellflower
Long Beach 4, California

Internship—Mixed or Rotating
Oral Surgery
Anesthesia
Oral Pathology
Prosthodontia
Periodontia
Endodontia
Operative Dentistry
Hematology
Oral Diag. & Treat. Plan
Radiology

U. S. Naval Hospital
Oakland, California

Internship—Mixed or Rotating	Residency—Straight
Oral Surgery	Oral Surgery
Anesthesia	
Oral Pathology	
Prosthodontia	
Periodontia	
Endodontia	
Osteology	
Hematology	
Radiology	
Basic Science	

Dental Hygiene Education

The Council on Dental Education and its Committee on Training Dental Hygienists have been working on plans for conducting an accreditation program for the schools for the training of dental hygienists. The Committee has studied the curricula of 14 of these schools and has found considerable variation between the amount of time given to the different courses as well as considerable variation in their content.

At its recent meeting, the Council authorized the Committee on Training Dental Hygienists to continue its study of the problem and to investigate the possibility of utilizing in the dental hygiene curriculum, some of the existing courses in the liberal arts colleges and universities. These courses might include the survey-type courses in the physical sciences and in the biological sciences as well as certain of the elementary courses in the sciences. The Council's Committee on Training Dental Hygienists plans to hold a meeting soon, at which time it will explore with a group of consultants the possibility of utilizing some of the existing courses now offered in the liberal arts colleges and universities. The Committee is certain that such a group of standard and established courses will not be able to perform all the functions required of courses in the dental hygiene curriculum. The Committee does feel, however, that it is possible that a significant amount of the dental hygiene curriculum might include these existing courses and with little or no change in their content.

CURRENT LITERATURE

Dental, Oral and General Causes of Speech Pathology. Alvin F. Gardner. *Oral Surg. Oral Med. & Oral Path.* 2:742, June 1949.

Speech is an index of culture; therefore, early orthodontic treatment and correction of congenital deformities are of primary importance. In addition to correction of malocclusion and restoration of function, orthodontia must also restore speech.

Articulation, enunciation and pronunciation of words is the process of speech most directly related to dentistry. Articulatory defects are those caused by dental defects and cleft palate. Linguistic defects pertain to the intellectual aspects of the language, the association of word and object. Stuttering, aphasia, speechlessness caused by accidents or local brain lesions are common disorders of this type. Phonatory disorders are manifested by defective vocal bands, aphonia being the primary condition.

The usual causes of speech defects are incorrect imitation by the child, late maturation, partly or wholly edentulous oral deformity and the presence of a hearing deficiency. The orthodontist must differentiate between hearing deficiency and dental defects as the etiology of speech disorder. Speech defect caused by missing teeth or oral deformity is called dyslalia.

The tongue must compensate for all oral deformities; however, it may produce a malalignment of the teeth. Correct surgical treatment of cleft lips and palates, operative repair, orthodontic treatment, or placing of an obturator is accomplished before speech therapy is instituted.

The three dental defects definitely causing speech disorders are open bite, maxillary or mandibular protraction, and mandibular retraction.

Rhinolalia aperta is a nasal obstruction in speech caused by paralysis of the velum, cleft palate and velar insufficiency. The palate is always open. In rhinolalia clausa, the soft palate is closed, due to adenoids or other obstructions in the nasopharyngeal port.

General conditions such as spasticity with cerebral palsy, Mongolism and cretinism, also present speech and dental problems.—*James R. Jensen.*

Journal of Oral Surgery
October 1949

All titles below are reviewed by Herbert J. Bloom, Detroit.

Traumatic Injuries to the Temporomandibular Joint. Irving Salman, New York.—277.
Complications in the Administration of Thiopental Sodium. Ellsworth A. Bruce, El Centro, Calif. —292.
Mouth Cancer. Harry C. Saltzstein and Robert S. Pollack, Detroit.—299.
Status of Procaine Toxicity. Julian S. Sachs, New York.—312.
Impacted Mandibular Third Molar. Irvin V. Uhler, Lancaster, Pa.—314.
The Periapical Abscess. J. Roy Bourgoyne and James H. Quinn, Memphis.—320.

Traumatic Injuries to the Temporomandibular Joint. Irving Salman.

Fractures of the condyles do well without accurate realignment of the fragments. Satisfactory results are obtained by simple interdental methods of immobilization.

A shallow mandibular fossa with a low eminentia articularis, and loose, lax ligaments are predisposing factors in dislocation of the joint. Following reduction of an acute dislocation the mandible should be immobilized for a few weeks to permit the injured periarticular tissues to regain their normal tone. Injuries to the periarticular tissues before they have returned to normal elasticity and tone may be a factor in hypermobility of the temporomandibular joints.

The injection of a sclerosing agent into the temporomandibular joint is indicated in subluxation and chronic dislocations. A 26 gage, 1½ inch needle is inserted posterior to the head of the condyle (mouth open) until contact is made with the medial wall of the fossa. About 0.25 cc. of 2 per cent procaine hydrochloride is injected. With the needle in position the syringes are changed and 0.25 cc. to 0.5 cc. of 5 per cent sodium psylliate is deposited in the joint cavity. The procedure is always done bilaterally. Four or five injections repeated every ten days to two weeks may be necessary. Postoperative reactions may include pain, edema, trismus and a shift of occlusion which will persist four or five days.

Case reports indicated favorable results with this technic.

Complications in the Administration of Thiopental Sodium. Ellsworth A. Bruce.

Since thiopental sodium (Pentothal) has become the anesthetic of choice in so many dental offices, the author wishes to stress that the oral surgeon and dentist have a moral and legal obligation to acquire a sound understanding of the physiologic actions of the drug and be capable of meeting any emergency that may arise in the administration. The ease and simplicity of its administration may lull the inexperienced anesthetist into a feeling of false security; therefore, a knowledge of the complications and their treatment is emphasized.

Dr. Bruce proceeds to enumerate the preliminary precautions which may be utilized in the prevention of many untoward reactions such as proper premedication, position of the patient, maintenance of a patent airway, concentration, speed and preferred method of administration. The complications which may occur such as injection into an artery, clogged needle, laryngospasm, cardiac arrest and the technics for their prevention and treatment are discussed in detail. The author has covered the problem of laryngospasm particularly well and since this complication is more common with thiopental sodium than with other anesthetics, it is most advantageous for the surgeon to be familiar with its prevention and treatment.

Mouth Cancer: the Dentist's Opportunity for Early Treatment and Control. Henry C. Saltzstein and Robert S. Pollack.

The average person, when first suspecting a growth within the mouth, often thinks of his dentist first. In a small personal series of 36 patients, 15 (42 per cent) consulted their dentist first. In only 2 cases there was no delay in treatment.

Most cancers of the oral mucous membranes start as small indurated ulcers which infiltrate into the surrounding tissues. A few start as papillomas or within an indurated area without ulcer formation. Malignant glandular tumors do occur but are not common in the tongue, the floor of the mouth or buccal mucosa. Cancers of the buccal mucosa produced no true symptoms. In tumors along the floor of the mouth and tongue, pain was the first symptom.

Any lesion that arouses even the slightest suspicion should be subjected to immediate biopsy. If the lesion proves to be a cancer, a relatively uncomplicated procedure may be all that is necessary to treat it effectively.

A negative biopsy can lull one into a false sense of security. In general, a good rule to follow is that any mouth ulcer which does not heal after two weeks of conservative treatment should be regarded as cancer until a differential diagnosis is made.

Six illustrative case reports are presented. The problems of different forms of treatment are discussed.

Present Status of Procaine Toxicity. Julian S. Sachs.

The purpose of this paper is to re-evaluate the status of procaine toxicity and idiosyncrasy in the light of recent findings.

Experimentalists administered more than 2,000 intravenous infusions of the drug, establishing a procaine blood level of 14 mg. per kilogram of body weight for man. No cases of procaine sensitivity or any contraindication for the use of the drug was noted. In dental practice, if 2 cc. of 2 per cent solution of hydrochloride were inadvertently administered intravenously, a blood level of 1 mg. per kilogram would be established.

The adjuvants usually included to potentiate the action of the procaine will cause vasoconstrictor effects with possible serious results in patients suffering from cardiac disease.

Vertigo and syncope following injections cannot be ascribed at all times to pharmacological effects. Often they are due to the psychologic attitude of the patient.

A Conservative Technic for the Management of a Common Type of Impacted Mandibular Third Molar. Irvin V. Uhler.

The purpose of the paper is to take the practitioner over the various steps of removal of the vertical type third molar, lying just beneath or protruding slightly through the crest of the alveolar ridge.

The flap is reflected after cutting the interproximal septa from second molar to the first bicuspid, and making an incision from the distolingual aspect of the second molar out toward the cheek at a 45 degree angle. Saliva, blood and operative debris are removed by

suction. The coronal aspect is exposed by bone burs or chisels without exposure of the lingual aspect.

A sharp chisel is introduced into the buccal groove and a sharp clean blow is struck with a mallet along the long axis of the tooth. If only the distal portion of the tooth comes away, the roots are separated with a bur or chisel. If the tooth shows movement, the grooves are deepened with a bur until the tooth can be split with an elevator. The operative site is frosted with a powder of 50 per cent penicillin, 25 per cent sulfanilamide and 25 per cent sulfathiazole. A dressing of iodoform gauze is inserted if the clot seems inadequate.

The Periapical Abscess. J. Roy Bourgoyne and James H. Quinn.

The symptoms and signs of a periapical abscess include: hypersensitivity to touch, elongation of the tooth, swelling of the gingiva, involvement of regional lymph nodes, tooth mobility and facial swelling. The x-ray is of value but the severity of the infection is not indicated by the extent of visible bone loss.

A minor surgical procedure is useful during the time of heat therapy.

The use of sulfonamides does not obviate the need for surgical treatment. In tissue infections caused by organisms of the mouth, sulfathiazole, sulfadiazine, sulfanilamide are equally effective. In a study of 300 patients the predominating organism was *Staphylococcus aureus.*

As soon as the subacute stage is reached, the tooth should be extracted, regardless of the amount of swelling. If the extraction of the tooth is done under general anesthesia, the postoperative pain is less and the general condition better than if local anesthesia is used.

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Factors Influencing the Incidence of Bacteremias Following Surgical Procedures in the Oral Cavity. Joseph P. Lazansky, Leonard Robinson, and Lillian Rodofsky, Tufts College Dental School, Boston, Mass.—533.

An Adhesive Penicillin Ointment for Topical Application. Jacob T. Rothner, Herbert M. Cobe, S. Leonard Rosenthal, and Jack Bailin, Temple University, School of Dentistry, Philadelphia, Pa.—544.

The Organic Elements of the Enamel, II. The Organic Framework of the Internal Part of the Enamel, with Special Regard to the Organic Basis for the So-called Tufts and Schreger's Bands. Reidar F. Sognnaes, Harvard School of Dental Medicine, Boston, Mass.—549.

The Organic Elements of the Enamel, III. The Pattern of the Organic Framework in the Region of the Neonatal and Other Incremental Lines of the Enamel. Reidar F. Sognnaes, Harvard School of Dental Medicine, Boston, Mass.—558.

Dentino-Enamel Cuticle Present in Adult Human Teeth. Victorino G. Villa, University of the Philippines, Manila, Philippines.—565.

Mercury Analysis of One Hundred Amalgam Restorations. Ralph W. Phillips and Marjorie L. Swartz, Indiana University School of Dentistry, Indianapolis, Ind.—569.

Suggested Revisions for Testing Dental Elastic Impression Material. James Cresson, Milford, Delaware.—573.

The Hydrogen-Ion Concentration of the Saliva, II. The Relationship Between Hydrogen-Ion Concentration and Rate of Flow of Saliva. D. J. Anderson, Guy's Hospital Medical School, London S. E. 1, England.—583.

The Relation Between Buffering Capacity, Viscosity, and Lactobacillus Count of Saliva. James J. Rae and Charles T. Clegg, University of Toronto, Toronto, Canada.—589.

Geographic Variations of Dental Caries in Oregon, II. Dental Caries Among Institutionalized Children and the Possible Influence of Certain Ecological Factors on Its Incidence. Demetrios M. Hadjimarkos and Clara A. Storvick, Oregon State College, Corvallis, Ore.—594.

Dental Effects of Exposure to Fluoride-Bearing Dakota Sandstone Waters at Various Ages and for Various Lengths of Time, II. Patterns of Dental Caries Inhibition as Related to Exposure Span, to Elapsed Time Since Exposure, and to Periods of Calcification and Eruption. A. L. Russell, South Dakota State Department of Health, Pierre, S. D.—600.

Salivary Citrate and Dental Erosion. Isadore Zipkin and F. J. McClure, National Institute of Dental Research, National Institutes of Health, Bethesda, Md.—613.

International Association for Dental Research. Proceedings of the 27th General Meeting, Chicago, Ill., June 24-26, 1949. Compiled by H. B. G. Robinson, Ohio State University.—627.

Factors Influencing the Incidence of Bacteremias Following Surgical Procedures in the Oral Cavity. Joseph P. Lazansky, Leonard Robinson, and Lillian Rodofsky.

The incidence of transient bacteremias following tooth extraction and periodontal scalings was studied in 221 cases. In the initial 161 cases, three 10 cc. blood samples were taken. A preoperative sample (sample A) was withdrawn 15 to 30 minutes prior to operation. A second sample (sample B) was taken within the first minute following completion of the operation, while the third blood specimen was withdrawn after ten minutes had elapsed. Since in the first 73 cases no bacteria were recoverable ten minutes after operation, the ten-minute interval was reduced to five minutes for the remainder of the study. Because the preoperative blood sample in the initial 161 cases yielded no bacteria, it was discontinued as a routine procedure.

Transient bacteremias were detected 22 times in 221 operations, an overall incidence of 10 per cent. The organisms were alpha hemolytic streptococci except in one instance, in which the organism was a non-hemolytic (gamma) streptococcus. In 56 single extractions, one positive blood culture was obtained (2%). In 92 multiple extractions, positive blood samples occurred in 16 of the cases. In 72 periodontal scalings, positive blood samples resulted in 5 cases (an incidence of 7%). The bacteremias were of very short duration. In the majority of cases, bacteria were detected only within the first minute following completion of the operation. The incidence was greater when moderate or extensive trauma accompanied the operation than when only slight trauma was involved. Significantly greater numbers of bacteremias occurred following extraction of 2 or more teeth than following extraction of single teeth. Variations in tooth mobility and vitality and the presence of periodontal disease or apical infection did not appear to influence the incidence of bacteremia.

An Adhesive Penicillin Ointment for Topical Application. Jacoby T. Rothner, Herbert M. Cobe, S. Leonard Rosenthal, and Jack Bailin.

Carboxymethyl cellulose with petroleum is a suitable vehicle for the topical application of penicillin in the treatment of Vincent's infection and similar infections of the oral mucosa. Preferably, it should contain 10,000 units of crystallin penicillin per gram.

The base alone has no antibacterial properties, but is not toxic and is compatible with crystallin penicillin. It can be safely stored at room temperature for at least 7 months.

The ointment will remain *in situ* for several hours, longer than necessary to exert its antibacterial action.

The Organic Elements of the Enamel, II. The Organic Framework of the Internal Part of the Enamel, With Special Regard to the Organic Basis for the So-called Tufts and Schreger's Bands. Reidar F. Sognnaes.

The organic framework of adult human teeth was isolated by a low-temperature demineralization in 5 per cent trichloro-acetic acid and examined through binocular observation, microdissection, smears, and paraffin sections. In contrast to the homogenous external portion, with its wide and straight-running prisms, the internal organic framework of the enamel exhibited densely packed prism sheaths arranged in longitudinal corrugated segments. Viewed in transversely cut paraffin sections the central part of these denser segments was found to be responsible for the appearance of the so-called tufts. Viewed in a longitudinal plane the corrugated pattern of the organic framework reflected itself in grossly visible Schreger's bands, indicating that these bands are independent of the pattern or degree of calcification. It is suggested that the morphology of the external dentin surface, which embryologically precedes the formation of enamel, may have a bearing upon this pattern of the organic framework in the internal enamel, and may even be reflected in the surface texture of the enamel in cases where a scalloped dentin surface is covered with only a thin shell of enamel.

The Organic Elements of the Enamel, III. The Pattern of the Organic Framework in the Region of the Neonatal and Other Incremental Lines of the Enamel. R. F. Sognnaes.

Caries-free deciduous molars, extracted just prior to normal exfoliation, were simultaneously fixed and decalcified in a 5 per cent trichloroacetic acid-formalin solution at low temperature (1° Centigrade), prepared for paraffin sections and stained with several standard stains. It was found that the organic framework has a pattern of its own in the regions of the neonatal and other incremental

lines, consisting in a number of denser zones along contemporarily formed prism sheaths. The existence of these organic structures is believed to explain satisfactorily the morphological appearance of the incremental lines of the enamel, whether they be accentuated or not, and whether they be viewed in decalcified sections or in ordinary ground sections.

Dentino-Enamel Cuticle Present in Adult Human Teeth. Victorino G. Villa.

The presence of the dentino-enamel cuticle prior to dentinogenesis and amelogenesis is generally recognized. Whether this cuticle, however, persists in adult teeth after having undergone the maturation process is a question which, apparently, is not yet definitely answered. Decalcified sections of two adult human teeth showing a recovered enamel matrix and a membranous structure which is interpreted as the dentino-enamel cuticle are presented in the report. It is also shown that the cuticle appears to be resistant to caries action. The undermining caries, in the specimen presented, progresses between the dentino-enamel cuticle and the enamel matrix at the sacrifice of the latter. Some investigator believed that in undermining caries of the enamel it is the dentin which is attacked first and later the enamel in a "backward" manner.

Mercury Analysis of One Hundred Amalgam Restorations. R. W. Phillips, and M. L. Swartz.

This analysis of 100 amalgam restorations shows the average mercury content to be 45.4 per cent with extremes of 28.6 per cent and 61.0 per cent. It can be seen from this research that there is a wide variation in the residual mercury content of individual restorations, dependent upon the manipulative technic used. Attention to certain fundamentals can minimize the amount of mercury remaining in the restorations and thus assure maximum strength and resistance to tarnish.

Suggested Revision for Testing Dental Elastic Impression Materials. J. Cresson.

Test results obtained from A.D.A. Specification #11 for Hydrocolloidal Impression Materials and Medical Department Tentative Specification #MD-1285D for Alginate Impression Materials are shown to be capable of being misinterpreted or leading to faulty conclusions.

Slightly different tests have been devised which more truly measure the value of such materials and yield values which permit comparison between different materials or manufacturing processes.

A new apparatus is described with which a cylinder of material being tested can be compressed to a given level by means of a thumb screw and dial gauge. This permits the determination of permanent deformation for a given total deformation for materials of varying rigidities.

The time factor in testing alginate impression materials is also discussed and test results given showing the importance of this factor.

The Hydrogen Ion Concentration of the Saliva, II. The Relationship Between Hydrogen Ion Concentration and Rate of Flow. D. J. Anderson.

Experiments were conducted with a microelectrode system which made possible direct measurement of saliva pH in the mouth. Results during control periods showed a negative correlation between hydrogen ion concentration and rate of flow of saliva. In a second series of experiments the effect of acidifying and alkalinizing drugs on salivary hydrogen ion concentration was tested. It was found that there was a small though statistically significant rise in $[H^+]$ after a 5 Gm. dose of NH_4Cl, and a fall after a 10 Gm. dose of $NaHCO_3$. The relationship between $[H^+]$ and rate of flow was maintained throughout. The physiological and clinical significance of the recorded changes is discussed.

The Relation Between Buffering Capacity, Viscosity and Lactobacillus Count of Saliva. James J. Rae, and Charles T. Clegg.

There seems to be no marked relationship between buffering capacity and salivary lactobacillus counts. There seems to be no significant relationship between the viscosity of saliva and the lactobacillus count.

Geographic Variations of Dental Caries in Oregon, II. Dental Caries Among Institutionalized Children and the Possible Influence of Certain Ecological Factors on Its Incidence. Demetrios M. Hadjimarkos, and Clara A. Storvick.

Dental examinations by means of mouth mirror and explorers were given to 163 school children between the ages 6 to 16, inclusive, residing in an institution known as the Children's Farm Home of Oregon. Their dental caries experience was found to be consider-

ably lower as compared with that of school children of the same age groups examined in four counties of Oregon.

The fluoride content of the water supply used at the institution was determined and found to be 0.3 ppm. The over-all food intake of the subjects while in residence at the institution was investigated and revealed that their diets were nutritionally adequate. Furthermore, indications were that the use of sugars and concentrated sweets was not "excessive."

It is believed by the authors that the low incidence of caries in the present study was brought about by a combination of the adequacy of the diet and the restriction in the intake of refined sugars and sweets in general.

Dental Effects of Exposure to Fluoride-Bearing Dakota Sandstone Waters at Various Ages and for Varying Lengths of Time, II. Patterns of Dental Caries Inhibition as Related to Exposure Span, to Elapsed Time Since Exposure, and to Periods of Calcification and Eruption. A. L. Russell.

During the winter of 1947-48 mirror-and-explorer dental examinations were given 2,140 white elementary and high school children of Mitchell, South Dakota. Among them were 297 migrant children with previous exposure to a fluoride-bearing water. Those whose exposure had terminated before eruption of the first permanent molars showed caries-inhibitory effects which persisted for a time but were virtually lost by the age of 14 to 16 years. In migrants 13 to 17 years of age with F exposure beginning at birth, tooth types with F exposure only during the period of calcification presented slight evidence of caries inhibition, which was marked only when F exposure had continued for some time after eruption. As a working hypothesis it was suggested that the fluorides inhibit dental caries when incorporated into teeth either during calcification or after eruption; that the inhibitory effect tends slowly to be lost and hence requires periodic or continual renewal for a maximum and lasting effect.

Salivary Citrate and Dental Erosion. Isadore Zipkin, and F. J. McClure.

Application of the citric acid method proposed by Pucher, Sherman, and Vickery and modified by Perlman, Lardy, and Johnson, for the analysis of saliva, was critically studied and a satisfactory procedure adopted. The citric acid in saliva is quite unstable, but by addition of H_2SO_4 the saliva is stabilized and recovery of added citric acid is satisfactory. Amounts of citric acid varying from 0.010 mg. to 0.450 mg. in 10.0 ml. specimens of saliva may be determined.

Although the number of individuals involved is small, the general pattern of erosion was observed to be as follows: (a) the upper teeth show a greater degree and a greater prevalence of erosion than the lower teeth, (b) the teeth of the right and left quadrants of both jaws have a similar degree of erosion, and (c) the severity of erosion increases with age.

The citric acid content of stimulated saliva varies from 0.20 mg. per cent to about 2.00 mg. per cent in individuals with and without dental erosion. There is a slight increase with age in the citric acid content of stimulated salivas.

On the basis of the data thus far accumulated, there appears to be a positive statistical correlation between the severity of human erosion and the salivary citrate content.

DEATHS

Brown, Charles E., Florence, Ore.; College of Physicians and Surgeons, 1915; died December 19; aged 60.

Faulkner, James H., South St. Paul, Minn.; died December 10; aged 52.

Feirstein, Isaac, Miami, Fla.; died November 22.

Long, Edward A., Lewiston, Mont.; died November 29; aged 75.

Mauget, Charles A., St. Louis; died December 11; aged 71.

Ratcliff, Arthur B., St. Joseph, Mo.; Kansas City Dental College, 1902; died November 21; aged 72.

Ratliff, W. E., Houston, Texas; died November 15.

Reelhorn, S. R., Kirkersville, Ohio; died in November; aged 72.

Richards, Alfred, Norwich, Conn.; died in November; aged 68.

Richards, Oren B., Moosic, Pa.; Baltimore College of Dental Surgery, University of Maryland, 1898; died October 16; aged 74.

Rider, Harry E., Portland, Ore.; School of Dentistry, North Pacific College of Oregon, 1921; died November 23; aged 58.

Rinnert, Kenneth M., Kirklin, Ind.; School of Dentistry, St. Louis University, 1925; died November 8; aged 51.

Rion, Croxton L., Seattle; School of Dentistry, University of Louisville, 1904; died December 17; aged 72.

Ritt, Adolph, Forest Hills, N. Y.; New York College of Dentistry, 1904; died October 22; aged 74.

Robinson, Forster, Lima, Ohio; Ohio College of Dental Surgery, University of Cincinnati, 1897; died September 13; aged 75.

Robinson, Robert A., Albany, N. Y.; School of Dentistry, University of Pennsylvania, 1917; died December 7; aged 56.

Robinson, Warren E., Toledo, Ohio; Ohio College of Dental Surgery, University of Cincinnati, 1905; died October 8; aged 69.

Rohrer, Edward J., Los Angeles; Chicago College of Dental Surgery, 1893; died in October; aged 77.

Rosen, Harry, Yonkers, N. Y.; College of Dentistry, New York University, 1905; died October 5; aged 66.

Rosenberg, Joseph H., Kingston, N. Y.; School of Dental and Oral Surgery, Columbia University, 1919; died December 1; aged 52.

Rosenstein, Abraham F., New York; New York College of Dentistry, 1915; died October 19; aged 59.

Roth, William A., Fairbury, Ill.; Chicago College of Dental Surgery, 1905; died September 26; aged 79.

Ruby, John E., Lousiville, Ky.; School of Dentistry, University of Louisville, 1896; died December 27; aged 73.

Ruiz Soler, L., Santurce, P. R.; Baltimore College of Dental Surgery, 1915; died in July.

Russ, William W., Lawrence, Kan.; Western Dental College, 1900; died October 15; aged 87.

St. Angelo, Leonard J., Frederic, Wis.; Dental School, Northwestern University, 1941; died November 3; aged 33.

Sanborn, William E., Detroit; Department of Dental Surgery, Detroit College of Medicine, 1896; died October 1; aged 73.

Scheffer, Gordon L., Westfield, N. J.; School of Dentistry, University of Pennsylvania, 1905; died November 29.

Schildt, Albert H., Duluth, Minn.; School of Dentistry, Temple University, 1885; died December 1; aged 91.

Schneyer, Leon, New York; Medico-Chirurgical College of Philadelphia, 1910; died in August.

Schreiber, Joseph J., Madison, Wis.; Dental School, Marquette University, 1916; died September 28; aged 58.

Schreiber, William L., Philadelphia; School of Dentistry, University of Pennsylvania, 1901; died October 14; aged 72.

Seibert, Edward F., Boise, Idaho; Lincoln Dental College of Cotner University, 1912; died January 7; aged 60.

Sewell, M. R., Lavonia, Ga.; Southern Dental College, 1910; died October 13; aged 64.

Shapiro, Max S., Brooklyn; College of Dentistry, New York University, 1917; died October 14; aged 55.

Sherwood, Paul P., Ottawa, Ohio; College of Dentistry, Ohio Medical University, 1884; died October 2; aged 65.

Sherwood, Warren G., Johnstown, Pa.; Pennsylvania College of Dental Surgery, 1909; died October 1; aged 65.

Shuman, J. Walter, Bangor, Pa.; Pennsylvania College of Dental Surgery, 1895; died October 12; aged 73.

Slaughter, Wilson M., Greensboro, Ga.; Atlanta Southern Dental College, 1928; died May 25; aged 44.

Smith, Harold S., Chicago; Dental School, Northwestern University, 1905; died October 16; aged 67.

Smith, J. Allen, Colorado Springs, Colo.; School of Dentistry, University of Denver, 1890, died December 25.

Snyder, Stewart D., Jackson, Minn.; College of Dentistry, University of Minnesota, 1913; died October 10.

Soltis, William B., Indianapolis; School of Dentistry, Indiana University, 1925; died September 26; aged 48.

Spaulding, Frank U., Portland, Ore.; School of Dentistry, North Pacific College of Oregon, 1909; died October 17; aged 77.

Spratt, Robert A., Pawtucket, R. I.; Dental School, Tufts College, 1913; died October 4; aged 65.

Squires, Clarence A., Coffeyville, Kan.; Kansas City Western Dental College, 1935; died September 30; aged 42.

Stavin, Nathan M., New York; New York College of Dentistry, 1909; died January 11; aged 63.

Steadman, Edgar L., Ellington, N. Y.; died October 21; aged 93.

Stegeman, Frank L., Allegan, Mich.; College of Dental Surgery, University of Michigan, 1901; died October 23; aged 69.

Stewart, Arthur B., Sharon, Pa.; School of Dentistry, University of Pittsburgh, 1929; died October 20; aged 50.

Stocker, Carle G., Ramsay, Mont.; died September 29.

Struck, Victor F., Maplewood, N. J.; New York College of Dentistry, 1901; died November 1; aged 72.

Sullivan, John J., Brooklyn; Chicago College of Dental Surgery, 1901; died November 28; aged 72.

Sykes, Norris, Portland, Ore.: School of Dentistry, North Pacific College of Oregon, 1916; died in November.

Tenny, Robert C., Pueblo, Colo.; School of Dentistry, University of Pennsylvania, 1888; died December 2.

Terry, Winfield C., New York; College of Dental and Oral Surgery, 1911; died December 13; aged 61.

Teutonico, Arthur I., Lawrence, Mass.; Dental School, Tufts College, 1918; died November 21; aged 58.

Thompson, Fred T., Reno, Nev.; Chicago College of Dental Surgery, 1918; died December 1; aged 76.

Thompson, Omer A., Mechanicsburg, Ohio; Ohio College of Dental Surgery, University of Cincinnati, 1898; died October 3; aged 76.

Toland, B. M., Kosse, Texas; died October 25; aged 80.

Tomasek, Joseph L., St. Paul; College of Dentistry, University of Minnesota, 1906; died November 28; aged 65.

Torn, Daniel B., Jacksonville, Fla.; School of Dentistry, Tulane University, 1919; died October 28.

Travis, James W., Toledo, Ohio; College of Dental Surgery, University of Michigan, 1911; died September 22; aged 75.

Traw, Elbert C., Lebanon, Mo.; School of Dentistry, Washington University, 1904; died September 13; aged 76.

Turner, Claude D., Carnesville, Ga.; Atlanta Dental College, 1894; died November 17; aged 83.

Unger, Isaac, Bridgeport, Conn.; School of Dentistry, Temple University, 1913; died October 10.

Walker, Harold, Chicago; died September 24; aged 53.

Ward, Walter R., Terre Haute, Ind.; Louisville College of Dentistry, 1903; died December 13; aged 69.

Warta, Henry J., Monrovia, Calif.; Western Dental College, 1917; died September 10.

Watson, Scott E., San Diego, Calif.; Dental School, Tufts College, 1906; died September 30; aged 66.

Weimer, Linden C., Dayton, Ohio; Ohio College of Dental Surgery, University of Cincinnati, 1902; died October 22; aged 69.

Weinberger, Walter J., Waupun, Wis., Dental School, Marquette University, 1914; died November 13; aged 57.

Weiner, Paul, New York; School of Dentistry, University of Pittsburgh, 1941; died November 3; aged 58.

West, Clyde C., Chicago; Chicago College of Dental Surgery, 1905; died November 8; aged 70.

Wilde, Emil F., Milwaukee; Dental Department, Milwaukee Medical College, 1902; died October 14; aged 69.

Willson, Charles R., Aberdeen, S. D.; College of Dentistry, University of Iowa, 1917; died December 27; aged 54.

Wittek, John E., Norwood, Pa.; School of Dentistry, University of Pittsburgh, 1929; died October 15; aged 48.

Yeilding, Edward C., Birmingham, Ala.; Birmingham Dental College, 1904; died December 6; aged 75.

Zumoff, Samuel, Philadelphia; School of Dentistry, Temple University, 1924; died October 16; aged 54.

Zyner, William I., East Greenville, Pa.; School of Dentistry, University of Pennsylvania, 1904; died December 4; aged 73.

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ANNOUNCEMENTS

MEETINGS OF STATE SOCIETIES

State	Date	Place	Secretary	Address
Alabama	May 1-3	Biloxi, Miss.	G. W. Matthews	1922 Tenth Ave., S., Birmingham 5
Arizona	April 20-22	Grand Canyon	H. G. DeWolf	Valley National Bank Bldg., Tucson
Arkansas	April 2-5	Little Rock	D. M. Hamm	White Bldg., Clarksville
California	April 24-26	San Francisco	L. R. Ludwigsen	450 Sutter St., San Francisco
S. California	April 3-5	Los Angeles	M. E. Ralston	Medico-Dental Bldg., Pomona
Colorado	Oct. 4-7	Colorado Springs	R. A. Downs	724 Republic Bldg., Denver 2
Connecticut	May 22-24	Hartford	E. S. Arnold	37 Linnard Rd., W. Hartford
Delaware			L. Kreshtool	815 West St., Wilmington
D. of Columbia			K. H. Wood	202-1835 Eye St., N. W. Washington
Florida	Nov. 19-22	Hollywood	L. M. Schulstad	Professional Bldg., Bradenton
Georgia	Oct. 8-11	Atlanta	J. M. Heard, Jr.	Persons Bldg., Macon
Hawaii	Oct. 12-14	Honolulu	J. H. Dawe	P. O. Box 39, Honolulu 10
Idaho	June 26-28	McCall	A. R. Cutler	Eastman Bldg., Boise
Illinois	May 8-11	Springfield	P. W. Clopper	623 Jefferson Bldg., Peoria 2
Indiana	May 15-17	Indianapolis	E. E. Ewbank	Kingman
Iowa	May 1-3	Des Moines	H. I. Wilson	639 Insurance Exchange Bldg., Des Moines
Kansas	May 7-10	Kansas City, Mo.	F. A. Richmond	Brotherhood Bldg., Kansas City
Kentucky			A. B. Coxwell	1976 Douglass Blvd., Louisville
Louisiana	April 13-15	Monroe	J. S. Bernhard	407 Medical Arts Bldg., Shreveport
Maine	June 22-24	Belgrade Lakes	F. P. Gilley	31 Central St., Bangor
Maryland	May 1-3	Baltimore	E. L. Pessagno, Jr.	415 Medical Arts Bldg., Baltimore 1
Massachusetts	May 1-4	Boston	A. M. Bommer	349 Broadway, Revere
Michigan	April 24-26	Detroit	F. Wertheimer	Michigan Dept. of Health, Lansing
Minnesota			C. V. E. Cassel	242 Lowry Medical Arts Bldg., St. Paul
Mississippi	June 18-21	Biloxi	F. C. Sneed	Osyka
Missouri	May 7-10	Kansas City	R. R. Rhoades	201 Merchants Bank Bldg., Jefferson City
Montana	May 4-7	Helena	C. S. Renouard	304 Phoenix Bldg., Butte
Nebraska	May 8-10	Omaha	F. A. Pierson	Federal Securities Bldg., Lincoln
Nevada	May 8-9	Las Vegas	C. A. Paice	Boggs Bldg., Las Vegas
New Hampshire	June 18-20	Bretton Woods	F. E. Williams	814 Elm St., Manchester
New Jersey	April 26-28	Atlantic City	J. G. Carr	407 Cooper St., Camden
New Mexico	May 22-24	Albuquerque	J. S. Eilar	First National Bank Bldg., Albuquerque
New York	June 5-8	New York	C. A. Wilkie	1 Hanson Place, Brooklyn
North Carolina	May 18-20	Pinehurst	R. F. Hunt	Rose Drug Co., Bldg., Rocky Mount
North Dakota	May 7-10	Fargo	A. L. Smeby	Northwood
Ohio	Nov. 27-29	Cincinnati	E. G. Jones	185 E. State St., Columbus
Oklahoma	April 16-19	Tulsa	F. H. Binkley	Hennessey
Oregon			H. C. Fixott, Jr.	Medical-Dental Bldg., Portland
Panama Canal Zone			L. F. Baranowski	P. O. Box 102, Ft. Kobbe
Pennsylvania	Oct. 28	Atlantic City, N. J.	M. D. Zimmerman	Warne Clinic Bldg., Pottsville
Puerto Rico	July 16-17		J. F. Suarez	Box 3863, Santurce
Rhode Island			J. F. Colgan	838 Newport Ave., Pawtucket
South Carolina	May 7-9	Columbia	J. R. Owings	201 E. North St., Greenville
South Dakota	May 14-16	Huron	E. W. Elmen	Sioux Falls
Tennessee	May 10-12	Chattanooga	E. J. Justis	Exchange Bldg., Memphis
Texas	April 23-27	Dallas	W. Ogle	310 N. Ervay St., Dallas
Utah	May 15-17	Salt Lake City	B. F. McBride	Medical Arts Bldg., Salt Lake City
Vermont	May 21-23	Woodstock	J. A. Larrow	Middlebury
Virginia	April 17-19	Roanoke	J. E. John	804 Medical Arts Bldg., Roanoke
Washington	May 22-24	Spokane	F. J. Dingler	1502 Medical-Dental Bldg., Seattle 1
West Virginia	May 15-17	Huntington	A. B. Drake	Huntington
Wisconsin	April 11-13	Milwaukee	R. A. Mason	964 N. 27th St., Milwaukee
Wyoming	June 22-24	Cheyenne	T. A. Ward	326 Wyoming National Bank Bldg., Casper

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

State	Date	Place	Secretary	Address
Alabama	June 19	Birmingham	M. D. Edwards	120 Adams, Montgomery
Arizona			R. K. Trueblood	25 N. Second Ave., Glendale
Arkansas	June 19-22*	Little Rock	H. E. Hanna	Wilson Bldg., El Dorado
California	June 12	Los Angeles	K. I. Nesbitt	507 Polk St.,
	July 24	San Francisco		San Francisco 2
Colorado	June 19-23	Denver	W. D. McCarthy	724 Republic Bldg., Denver 2
Connecticut	June 20-24*	Hartford	C. G. Brooks, Recorder	302 State St., New London
Delaware	June 14-16	Wilmington	P. K. Musselman	143 W. Main St., Newark
D. of Columbia	June 5-9	Washington	J. R. Palkin	1835 Eye St., N. W., Washington
Florida	July 10-13*	Jacksonville	A. W. Kellner	P. O. Box 155, Hollywood
Georgia			R. C. Coleman	State Capitol Bldg., Atlanta 3
Hawaii			H. L. Houvener	7-8 Pantheon Bldg., Honolulu
Idaho	Aug. 1	Boise	F. L. Luce	510 First National Bank Bldg., Boise
Illinois	June 27-30	Chicago	W. A. McKee	503 Wood Bldg., Benton
Indiana	June 13-16*	Indianapolis	C. A. Frech	Gary National Bank Bldg., Gary
Iowa	June 5-9	Iowa City	H. M. Willits	719 Roshek Bldg., Dubuque
Kansas	June 7-8, 11-12	Kansas City, Mo.	G. L. Teall	Hiawatha
Kentucky	June 19-22	Louisville	R. I. Todd	Western Union Bldg., Richmond
Louisiana		New Orleans	A. R. deNux	Marksville
Maine	June 26-27	Augusta	R. A. Derbyshire	Box 387, Skowhegan
Maryland			W. D. Day	3811 Hadley Square E., Baltimore 18
Massachusetts	June 19-23†	Boston	J. C. Wilson	413 N. State House, Boston 33
	June 21-23‡			
Michigan	June 11-17	Ann Arbor	J. L. Champagne	3714 W. McNichols Road, Detroit 21
Minnesota	June 12-16	Minneapolis	F. A. Larson	1632 Washington St., N. E., Minneapolis
Mississippi	June 26-28	Jackson	J. C. Boswell	508 Lamar Bldg., Jackson
Missouri	June 5,6,9,10	Kansas City, Mo.	R. R. Rhoades	Central Trust Bldg.,
	June 7,10	St. Louis		Jefferson City
Montana	July 10-13	Helena	T. C. Betzner	301 Power Bldg., Helena
Nebraska	June 2-3**	Lincoln	C. A. Bumstead	924 Stewart Bldg.,
	June 8-10§	Lincoln		Lincoln
	June 12-14§	Omaha		
Nevada	June 5, Dec. 4	Reno	G. C. Steinmiller	Masonic Temple, Reno
New Hampshire	June 29-30		J. B. Brown	5 N. State St., Concord
New Jersey	June 5-9†		W. A. Wilson	150 E. State St., Trenton 8
	June 5-6‡			
New Mexico	June 26-29	Santa Fe	J. J. Clarke, Sr.	Artesia
New York	June 23-24 and	New York and	D. W. Beier	23 S. Pearl St.,
	Sept. 29-30§†	Buffalo		Albany 7
	June 27-30 and	New York		
	Oct. 3-6**†	Buffalo		
		Syracuse and Albany		
	June 24§‡	New York		
		Rochester and Buffalo		
	Sept. 30§‡	New York and Buffalo		
	June 27-28 and	New York and		
	Oct. 3-4**‡	Buffalo		
North Carolina	June 26	Raleigh	F. O. Alford	1109 Liberty Life Bldg., Charlotte 2
North Dakota	July 9-13*	Fargo	W. J. Ford	Fargo
Ohio	June 26-July 1	Columbus	E. D. Lowry	79 E. State St., Columbus
Oklahoma	June 14-16	Oklahoma City	N. D. Griffith	509 Medical Arts Bldg., Oklahoma City 2
Oregon	June 19-22*	Portland	A. F. Davis, Exec. Secy.	306 Public Service Bldg., Portland
Pennsylvania	June 19-24†	Philadelphia and	R. E. V. Miller	Northampton National
	June 19-22‡	Pittsburgh		Bank Bldg., Easton
Rhode Island	May 10††	Providence	F. M. Hackett	State Office Bldg., Providence

State	Date	Place	Secretary	Address
South Carolina	July 6-8	Columbia	E. G. Bumgardner	1517 Hampton St., Columbia
South Dakota		Sioux Falls	R. W. Ellis	Salem
Tennessee	June 12-15	Memphis	F. S. Maxey	804 Bennie Dillon Bldg., Nashville 3
Texas	June 18-23	Dallas	R. T. Weber	312 Capital National Bank Bldg., Austin
Utah	June 26		J. J. Dalpiaz	Helper
Vermont	June 26-28	Montpelier	F. A. Reid	Windsor
Virginia	June 13	Richmond	J. M. Hughes	715 Medical Arts Bldg., Richmond 19
Washington	June 26-31	Seattle	J. B. Kiefer, Jr.	510 Cobb Bldg., Seattle
West Virginia	June 26-28	West Liberty	C. R. Singleton	535 Medical Arts Bldg., Charleston 1
Wisconsin	June 12-16	Milwaukee	S. F. Donovan	Tomah
Wyoming	June 19-21	Cheyenne	W. J. Ryan	208 Boyd Bldg., Cheyenne

*Dentistry and dental hygiene.
†Dentistry.
‡Dental Hygiene.
§Practical examinations.
**Written examinations.
††Basic sciences examinations.

OTHER MEETINGS

Name	Date	City	Secy. or Chmn.	Address
Academy of Denture Prosthetics	May 1-7	Milwaukee	L. L. Furnas Secy.	La Jolla, Calif.
American Association of Orthodontists, Forty-Sixth Annual Session	May 8-11	Chicago	G. R. Moore Secy.	919 Oakland Ave., Ann Arbor, Mich.
American Board of Oral Surgery	April 2-3	Chicago	L. M. FitzGerald Secy.	718 Roshek Bldg., Dubuque, Iowa
American Board of Orthodontics	May 4-7	Chicago	S. C. Hopkins Secy.	1726 Eye St., N. W., Washington, D. C.
American Dental Association Ninety-First Annual Session	Oct. 30-Nov. 1	Atlantic City, N. J.	H. Hillenbrand Secy.	222 E. Superior St., Chicago
American Dental Society of Europe	July 19-22	Amsterdam, Holland	F. D. Derrick	140 Park Lane, London, W. 1.
American Public Health Association, Southern Branch, Dental Section	April 27-29	Birmingham, Ala.	P. Ayers Secy.	1912 Eighth Ave., S., Birmingham, Ala.
Canadian Dental Association	May 14-17	Toronto	D. W. Gullett	211 Huron St., Toronto, Ontario, Canada
Italian Medico-Dental Association, Twenty-Fifth Annual Convention on Stomatology	Sept. 26-30	Stresa (Lake Maggiore)	Enrico Goia	Via Lamarmora, 9, Torino, Italy
Mid-Continent Dental Congress, Tenth Annual Meeting	Nov. 26-29	St. Louis	J. E. Brophy Exec. Secy.	927 Syndicate Trust Bldg., St. Louis 1
National Board of Dental Examiners	April 10-11‡		G. L. Teall Secy.	Box 71 Hiawatha, Kan.
New England Dental Society, Annual Meeting	Oct. 4-5	Boston	A. R. Wilson Secy.	43 Farmington Ave., Hartford, Conn.
New Orleans Dental Conference	Nov. 5-8	New Orleans	M. R. Matta Secy.	8117 Oak St., New Orleans
Northeastern Society of Orthodontists, Annual Meeting	Nov. 6-7	Washington, D. C.	O. Jacobson Secy.	35 W. 81st St., New York
Ohio State University, College of Dentistry, Mid-Century Post College Assembly	April 19-20	Columbus, Ohio	C. Hebble Chmn.	College of Dentistry, Ohio State University, Columbus 10, Ohio
Pacific Coast Dental Conference	June 26-29	Seattle	C. R. Flood	605 Medical-Dental Bldg., Seattle
Temple Dental Alumni, Annual Meeting	May 9-10	Philadelphia	A. L. Borish	255 S. 17th St., Philadelphia 3
Tufts College Dental School, First Annual Berkshire Conference in Periodontology	June 13-17	Eastover, Lenox, Mass.		Berkshire Conference Tufts College Dental School, 136 Harrison Ave., Boston
University of Pennsylvania, School of Dentistry, Second Mid-Atlantic States Seminar in Oral Medicine	Nov. 5-10	Skytop, Pa.	L. W. Burket Director Postgraduate Courses	School of Dentistry, University of Pennsylvania, 4001 Spruce St., Philadelphia 4

Name	Date	City	Secy. or Chmn.	Address
University of Toronto, Faculty of Dentistry, Continuation Course in Nutrition as Applied to the Practice of Dentistry	May 18-20	Toronto	R. G. Ellis Dean	Faculty of Dentistry, University of Toronto, 230 College St., Toronto, Ontario, Canada
University of Toronto, Faculty of Dentistry, Continuation Course in Oral Surgery	April 17-21	Toronto	R. G. Ellis Dean	Faculty of Dentistry, University of Toronto 230 College St., Toronto, Ontario, Canada
University of Washington, School of Dentistry, Graduate and Postgraduate Courses in Orthodontics	Sept. 25	Seattle	W. L. Wylie Director	School of Dentistry, University of Washington, Seattle 5

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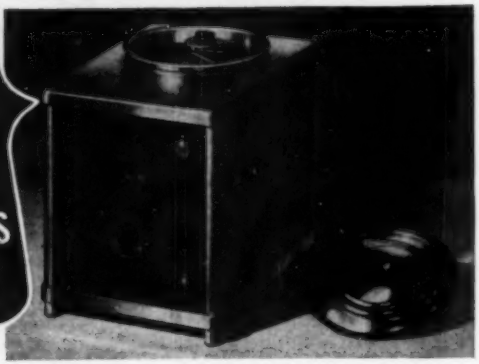

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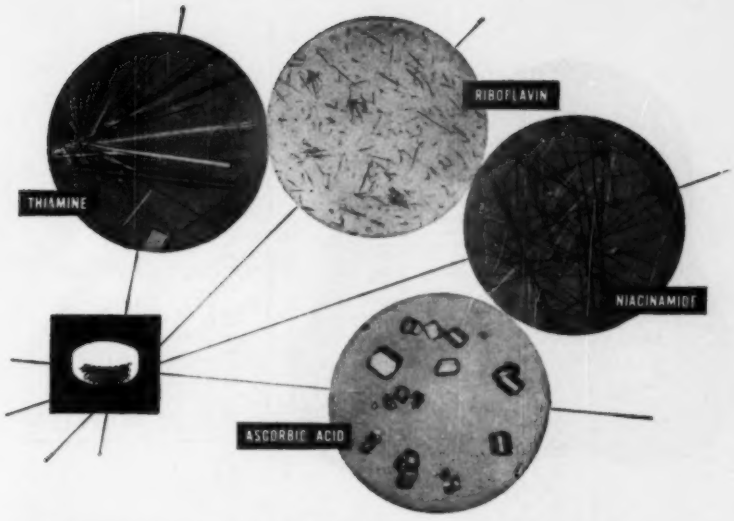

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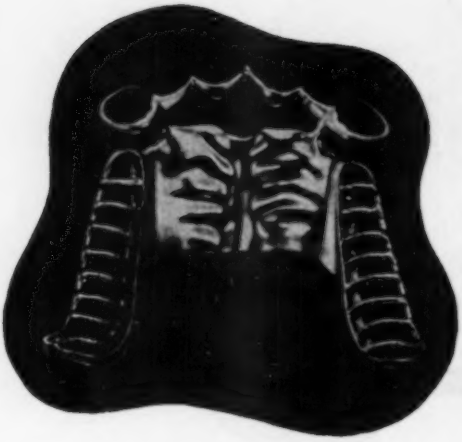

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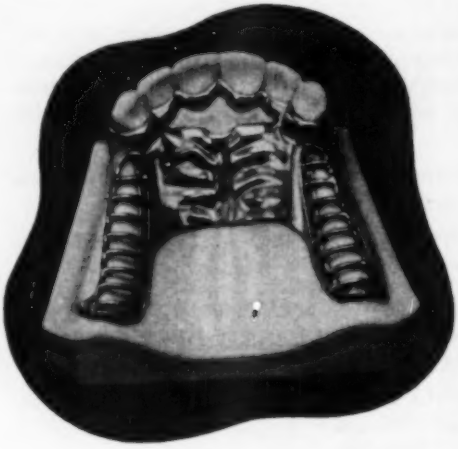

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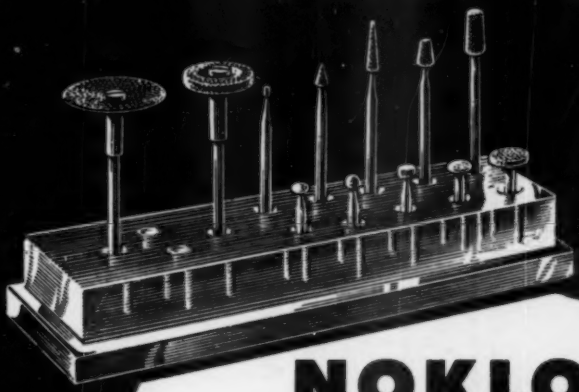

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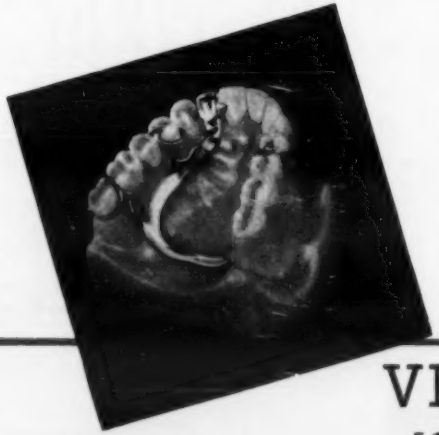

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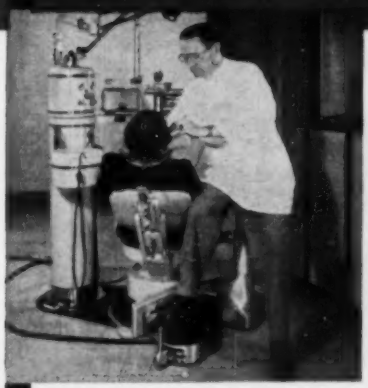

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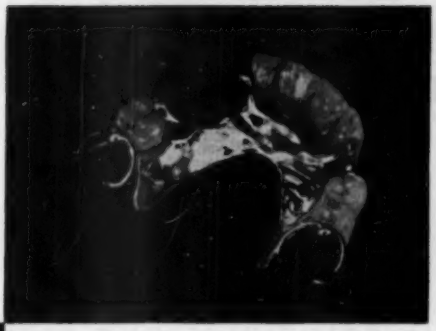

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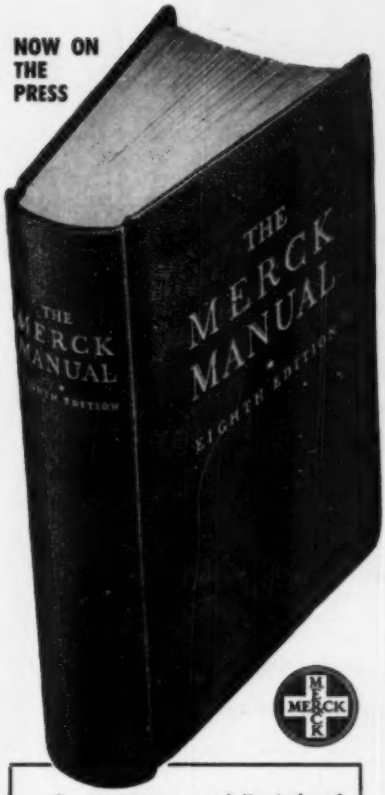

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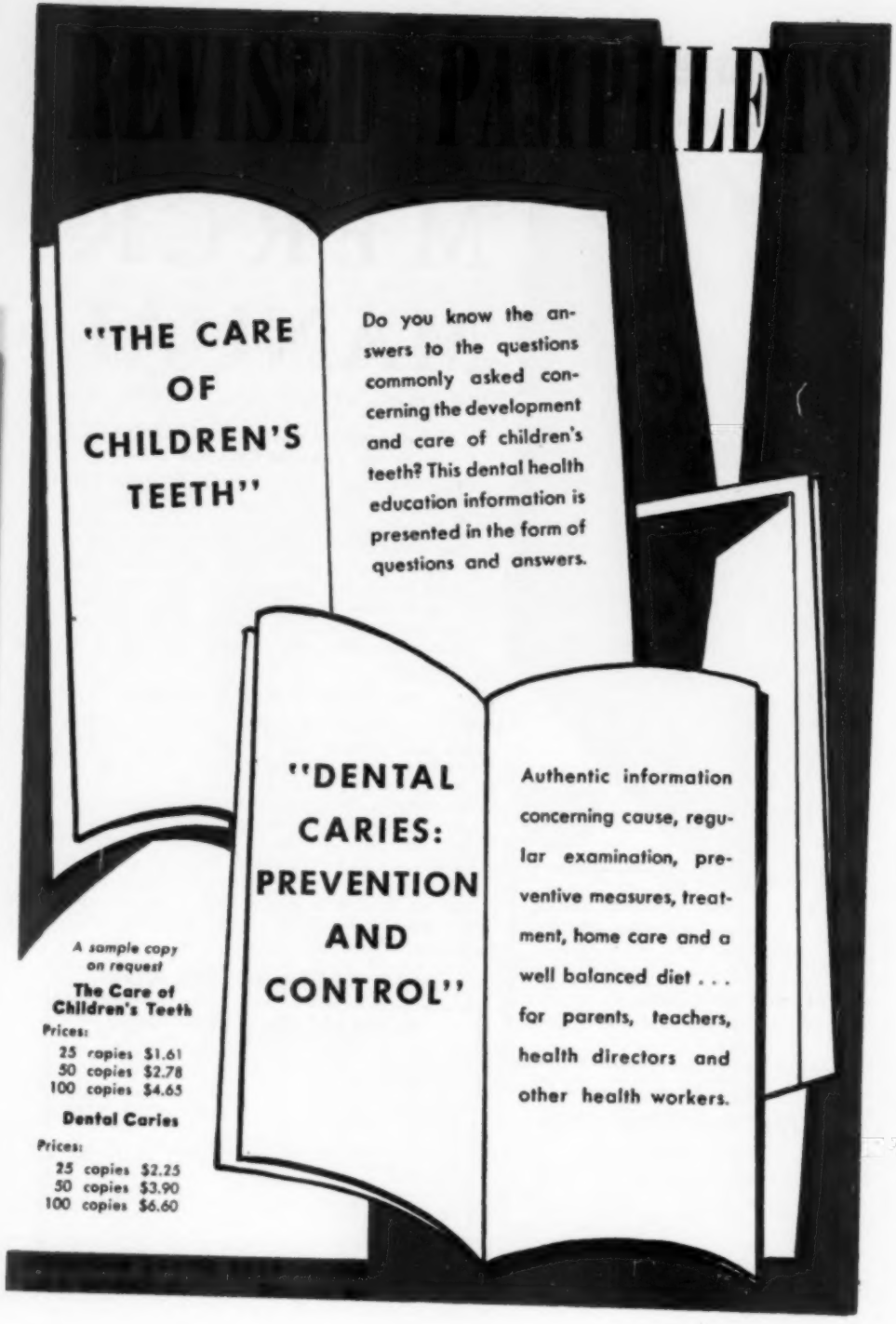
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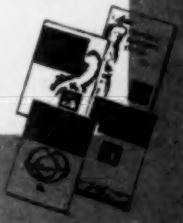

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